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of Transportation

**Federal Highway
Administration**

***Case Studies of
Transportation
Public-Private
Partnerships around
the World***

**Final Report
Work Order 05-002**

Prepared for:

**Office of Policy and
Governmental Affairs**

Prepared by:

**AECOM CONSULT
TEAM**

July 7, 2007

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Case Studies of Public-Private Partnerships for Transportation Projects around the World - Task Order 05-002

Dear Mr. March,

AECOM Consult, in association with DMJM Harris, FaberMaunsell, Maunsell of Australia, the National Council of Public-Private Partnerships, and the Ybarra Group, is pleased to provide the final report of *Case Studies of Public-Private Partnerships for Transportation Projects around the World*.

This report provides a fundamental understanding of PPP approaches and their potential consequences on project time, cost, and quality, and presents the results of actual PPP projects performed in several countries around the world through a series of case studies and cameo descriptions. The projects selected for case study vary in type and maturity, and cover the range of private sector involvement associated with different PPP approaches used in selected countries. Each case study explores the reasons why the sponsoring agency elected to pursue the project as a PPP, the structure of the partnership, the nature of project financial and delivery responsibilities, and the issues and impediments that confronted members of the PPP team and how they addressed them to move the project forward. The case studies also present the results and lessons learned from using the PPP approach applied to the each project. These case studies are intended to inform the reader about challenges and opportunities encountered by international practitioners of PPP approaches to project financing and delivery.

This report focuses on PPP applications to transportation projects in England, Australia, New Zealand, Hong Kong, India, Israel, Denmark, Sweden, and Argentina. The report also presents an overview of the PPP programs in England and Australia, including brief cameo descriptions of PPP projects in Australia and New Zealand that demonstrate the variety of project types involved, PPP approaches applied, and results achieved. Most of the projects profiled in this report were successfully delivered. However several faced major challenges for both the public agency sponsors and their private sector partners. These projects demonstrate that private sector involvement does not in itself guarantee project success and that multiple factors often beyond the control of project partners can significantly impact project results.

A separate chapter provides a summary discussion of developments in a number of developed and developing countries seeking to use PPP approaches to expedite their transportation infrastructure programs, drawing on the long experience of Western European nations such as England, France, Spain, and Italy.

A companion report focuses on PPP applications in the United States, which is a more recent entrant to the PPP marketplace but making great strides to exploit the opportunities offered by PPP approaches to project finance and delivery. A third report provides a guidebook on developing and implementing a transportation project as a PPP and its aimed at both the early practitioners of PPP projects as well as

those agencies just beginning to consider the possibility instituting some form of PPP arrangement for a particular project currently stalled for lack of available resources.

We appreciate the opportunity to perform this study of international PPP transportation projects. We acknowledge the support and assistance provided to the study team by members of the FHWA Office of Policy and Governmental Affairs, FHWA Office of the Administrator – PPP Unit, and FHWA Resource Center in San Francisco. We are especially grateful for your guidance and suggestions throughout this study effort.

Very truly yours,

A handwritten signature in cursive script that reads "Daniel L. Dornan".

Daniel L. Dornan, P.E.
Senior Consulting Manager
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CASE STUDIES OF TRANSPORTATION PUBLIC-PRIVATE PARTNERSHIPS AROUND THE WORLD

ABSTRACT

Transportation agencies around the world continue to face fiscal challenges caused by the growing gap between the costs of preserving and expanding highway infrastructure and available highway program funding. The lack of dedicated public funding sources for transportation (in most other countries high motor fuel taxes are generally used non-transportation social programs) and the burdens placed on current transportation infrastructure (both highway and rail) by a growing global economy has long prompted transportation policymakers overseas, especially in Western Europe, to develop and apply alternative ways to finance and deliver needed transportation infrastructure. A number of countries have turned to the private sector for relief in the form of contractual Public-Private Partnerships (PPPs), representing a wide variety of project financing and delivery approaches to access capital markets; implement new technology; and expedite project delivery, operations, and maintenance in a more cost-effective manner. The common element of a PPP is that the public sponsor of infrastructure projects engages the private sector to a greater degree in the performance of certain functions previously handled by the public sector. This can range from contracted maintenance services to full financing, development, operations, and preservation. Some countries have effectively turned over the responsibilities, risks, and rewards associated with performing these functions to private sector through long-term concessions or franchises, whose financing is supported by tolls, shadow tolls, or availability payments (a form of shadow tolls).

With the U.S. Department of Transportation and its surface transportation administrations encouraging their state and local counterparts to consider the selective use of PPP approaches to expedite urgent transportation projects, there is significant opportunity for state and local transportation agencies to add PPP approaches to their means of accomplishing their missions. One way to present the implications and potential applicability of PPP approaches is through the experience gained by early developers and implementers of these alternative delivery approaches. This report does so through a series of case studies and cameos of actual PPP projects from other countries which have long involved the private sector through various forms of PPPs, including England, Australia, New Zealand, Hong Kong, India, Israel, Denmark, Sweden, and Argentina. The report also discusses PPP legislative and project initiatives in a number of developed and developing countries seeking to use PPPs to expedite their transportation infrastructure programs, drawing on the long experience of other nations, such as England, France, Spain, and Italy. This information is intended to inform those in the U.S. considering the use of PPP approaches or interested in learning more about what others have or are doing to develop and implement PPP projects, noting both the challenges and opportunities encountered by long practitioners of these innovative approaches to project finance and delivery.

A companion report focuses on PPP applications in the United States. A third report provides a guidebook on developing and implementing a transportation project as a PPP and is aimed at both the early practitioners of PPP projects as well as those agencies just beginning to consider the possibility instituting some form of PPP arrangement for a particular project stalled for lack of available resources.

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1. INTRODUCTION

Since the late 1980s, public-private partnerships (PPP) have come to the fore in various countries around the world to expedite or otherwise make possible the provision of needed infrastructure which the public sector cannot provide in a timely manner by itself. PPPs provide an opportunity for governments to expedite the provision of social capital infrastructure in the form of schools, hospitals and roads while benefiting from greater cost-efficiency that may be achieved from private sector involvement. It is argued that alignment of incentives drives the efficiencies that are derived from PPP arrangements. Private sector participation in asset and service provision can maximize value for money for government by expediting financing, facilitating innovation, providing better risk management, and integrating life-cycle management.

Over the last twenty years, private involvement in financing and delivering transportation infrastructure has grown significantly as governments sought ways to leverage scarce public resources, especially in the absence of dedicated funding sources for transportation. More recently there has been as greatly expanded interest in PPPs to expedite transportation projects needed to accommodate the changing and expanding movement of people and goods across national boundaries previously closed by political adversaries. Among the factors driving the renewed interest in PPPs for transportation infrastructure financing and development overseas are the following developments over the last two decades:

- § Establishment of the European Common Market;
- § Creation of the European Union;
- § Break-up of the Soviet Union which spawned numerous sovereign nations in Central and Eastern Europe seeking entrée into the European Union;
- § Establishment of the South American Common Market;
- § Rapid economic expansion of the economies in China and India; and
- § Emergence of such nations as South Africa and Vietnam.

PPPs provide public agencies opportunities to deliver transportation facilities using private sector resources without necessarily committing public debt or equity. In the face of increasing gaps between infrastructure financing requirements and revenues, public agencies in other countries often view PPPs as a way to expedite critical infrastructure that may otherwise not be built.

The advantages of PPPs and the urgency of the transportation infrastructure needs has led to an increasing willingness by public agencies at both the national and local levels to consider and in some cases apply alternative funding, financing, contract delivery, and life-cycle preservation methods to leverage the scarce public resources. In many cases this has required legislation permitting the use of these alternative project delivery approaches by government agencies sponsoring transportation improvement projects.

PURPOSE AND OBJECTIVES

The purpose of this report is to promote greater understanding of the role institutional factors (including statutory, regulatory, financial, organizational, procedural, and cultural) play in

facilitating or impeding the formation and successful implementation of public-private partnerships and to identify effective strategies for overcoming institutional impediments and facilitating successful PPP development and implementation, based on the experience of a number of successful international PPP projects. To accomplish this purpose, the following study activities were performed by the study team:

- Conduct a literature review to characterize the types and implications of various institutional factors that significantly impact the potential for successful implementation of transportation PPPs;
- Develop and execute a study plan to collect secondary and direct information on the major institutional issues that confronted successfully implemented PPPs for transportation projects in other countries;
- Develop a series of case studies and brief cameos of PPPs projects that characterize international transportation project PPPs by facility type and contract type, describe their institutional challenges, and identify strategies to effectively overcome these impediments to successful PPP implementation; and
- Synthesize and document relevant study findings for inclusion in a guidebook to help prospective sponsors and participants in PPPs understand the institutional context for transportation projects, the institutional issues that can undermine formation or implementation of PPPs, and ways to deal with or overcome these impediments based on best practices cited from PPPs successfully implemented in the U.S. and other countries.

SCOPE AND METHODOLOGY

The study team reviewed and summarized the available literature on the application and management of PPPs for transportation infrastructure in other countries. This provided a summary of benefits, risks and critical success factors arising from PPP arrangements in England, Australia, New Zealand and other countries. The study team then assembled a list of international transportation PPP projects, from which a group was selected for developing the individual case studies, cameos, and vignettes. Information regarding these projects was developed from the literature, including that provided by relevant project websites, annual reports, and local knowledge. Additional insights were sought by direct surveys of project sponsors and providers, and in some cases interviews with representatives of public and private project partners.

While descriptive information is generally available for many PPP transportation projects around the world, there is a significant reluctance by project partners to respond to surveys or direct inquiries. Given the commercial and political nature of PPP arrangements, information required to provide a comprehensive evaluation of PPP projects is often incomplete, not available, or restricted. Furthermore, personnel from the private sector concession teams generally disperse at various junctures of the concession. For example financial and legal personnel involved in PPP projects disperse at financial closure of each project. Design and construction personnel often disperse after the project is opened to traffic. This further limited the amount of information that could be derived at either the consultation or development phases, which restricted the level of detail to which many of the international case studies could be developed, resulting in more project cameos and vignettes than originally planned.

As a consequence of this, the study team found that project partners whom we attempted to contact were often either not available or reluctant to respond, particularly those in the private sector. When we were able to make contact, many were reluctant to answer questions regarding issues that arose during the project and the strategies used to overcome them. The public sector sources were more forthcoming and candid in their discussion of the rationale for using a particular PPP arrangement to develop needed projects, as well as the key issues confronting their PPP projects and how they were addressed. When this information was available, a case study could be produced for the project based on the available documentation.

INTERNATIONAL PPP PROGRAM AND PROJECT CASE STUDIES AND CAMEOS

The review of international PPPs covered a variety of regions and countries where transportation PPPs are most prevalent or emerging. A representative list of international PPP projects involving transportation infrastructure development was selected for preparation of program overviews and project summaries that describe the projects, their PPP arrangements, major issues and strategies to address them, and results. These program overviews and project summaries are organized by region and country. To cover a variety of regions and countries around the world engaged in PPP transportation projects, a somewhat larger number of project summaries are provided to demonstrate the differences and similarities in the use of PPPs for transportation infrastructure development between regions and countries.

PPP program overviews were prepared for the England and Australia. In addition, case studies and cameos were developed for PPP transportation projects in England, Australia, New Zealand, the European Union, Asia, and South America, as listed below:

- **England**
 - M6 Tollway
 - Queen Elizabeth 2 Dartford Bridge
 - Second Severn Crossing Bridge
 - M1-A1 Link
- **Australia**
 - Sydney Harbor Tunnel
 - Melbourne CityLink
- **China**
 - Country Park Motorway - Hong Kong
- **Denmark and Sweden**
 - Øresund Bridge – Copenhagen to Malmö
- **India**
 - Second Vivekananda Bridge - Kolkata
- **Israel**
 - Yitzhak Rabin Trans-Israel Highway - Tel Aviv
- **Argentina**
 - Rosita-Victoria Bridge - Rosita, Victoria

Information on project type, PPP composition, project delivery method, concession period, financing structures, and key issues and strategies, and results are presented for each of these projects.

A number of transportation PPP projects described in the report from England, Australia, and New Zealand are likely to be most relevant to prospective sponsors of PPP projects in the U.S. PPPs in England have been predominantly design-build-finance-operate (DBFO) contracts financed by government-supported shadow tolls for highway projects and tolls for bridge/tunnel projects. Some of the more recent highway projects in England are using direct tolling for funding. PPPs in Australia and New Zealand have been primarily used for private toll road projects, most of which appear to have been financially successful. The successful application of PPP methodologies to the development of toll roads in these two countries is reflected in the number of toll road PPP project cameos at the end of the chapter on transportation PPP projects in Australia, New Zealand, and several other countries.

An additional chapter following England and Australian/New Zealand/Other Countries PPP program and project case study chapters provides a global profile of transportation infrastructure PPP project activity by region and country.

REPORT STRUCTURE

The remainder of the report has the following structure:

- Chapter 2: Public-Private Partnerships in Surface Transportation
- Chapter 3: Transportation PPP Experience in England
- Chapter 4: Transportation PPP Experience in Other Countries
- Chapter 5: Global Transportation PPP Experience
- Chapter 6: Results and Conclusions
- Appendix A: Glossary of Terms
- Appendix B: List of Acronyms
- Appendix C: Bibliography

Several companion reports provide additional insights into transportation PPPs implemented in the United States and guidance for U.S. transportation agencies and public decision-makers considering their implementation in this country.

- The second companion report focuses on transportation PPP programs and projects developed by transportation agencies in the U.S., including both state and local agencies, to expedite delivery of needed transportation projects to reconstruct or replace aging facilities or add capacity to support the nation's growing population and economy.
- The third companion report is a guidebook on transportation PPPs that is designed to help transportation agencies in this country understand, develop, implement, and manage transportation-related PPPs, based on the experience gained from PPP programs and projects in the U.S. and other countries.

2. PUBLIC-PRIVATE PARTNERSHIPS IN SURFACE TRANSPORTATION

This chapter provides an overview of public-private partnership (PPP) approaches to delivering surface transportation infrastructure projects and services worldwide. The chapter presents background information on the evolution of PPPs, defines transportation PPPs and the various types of approaches to involving the private sector in public-sponsored transportation projects, discusses the major benefits and risks associated with PPPs, and identifies the critical factors for successful development and implementation of a PPP project.

BACKGROUND

Private sector involvement in the provision of transportation infrastructure and services has been evolving for the last twenty-five years by nations overseas which realized early on that the lack of a dedicated transportation funding source required different approaches to financing and delivering transportation infrastructure, both highway and passenger rail. Hence there were early attempts at PPP arrangements in the late 1970s with highway concessions in France and the mid-to-late 1980s in places like Spain and England. The strongest impetus for transportation PPPs overseas occurred in England, where economic reforms encouraged a number of efforts to privatize major elements of the nation's transportation systems. These early efforts focused primarily on the most developed transportation systems, including railroads, public transportation, and aviation. These initiatives included efforts to more significantly involve private sector resources to help finance and deliver projects in various sectors of the economy, including health care, accommodations, defense, and transportation.

The major impetus for using PPPs in infrastructure projects occurred in England in 1992 when legislative and regulatory reforms were put in place under the name of Private Finance Initiative (PFI). PFI's are a subset of PPPs typically referred to as concessions or franchises, whereby the private sector assumes responsibility for the public asset through a long-term contract. Since that time, other countries in the British Commonwealth of nations have instituted their own PPP initiatives, including Australia, New Zealand, Scotland, and Canada.

With the creation of the European Union, its expansion after the collapse of the Soviet Union, and the revitalization of the European economy in the last decade, the interest and application of PPP approaches to transportation infrastructure delivery has spread across the world, with countries in Central and Eastern Europe, Asia, and Latin America seeking private partners to expedite the financing and delivery of major transportation projects aimed at addressing the opportunities presented by global changes in trade, mobility, and standards of living.

Since the mid 1980s, both public and private sectors in countries around the world have gained significant experience and confidence in using PPPs to get particularly large and complex infrastructure projects built. In addition, local urban governments are outsourcing maintenance of their road networks to lower costs and improve performance. Growing from a cottage industry to just under \$0.5 trillion dollar mega-industry investing in all kinds of infrastructure worldwide, including roads, railroads, airports, seaports, water/wastewater, and building, with almost \$0.8 trillion dollars in PPP financing for planned project yet to be completed.

Exhibit 2.1 shows the extent of PPP investment in infrastructure projects worldwide between 1985 and 2004. In the past two years, the level of investment has grown to almost \$2 trillion when counting all forms of infrastructure.

Exhibit 2.1 Worldwide PPP Infrastructure Projects since 1985 by Project Type*

Project Type	Total Planned & Funded Since 1985				Total Funded & Completed by 10/04				% Funded & Completed by 10/04	
	#	%	\$Billion	%	#	%	\$Billion	%	% of #	% of \$
Road	656	31%	\$324.7	37%	359	32%	\$157.3	35%	55%	48%
Rail	247	12%	\$280.6	32%	107	10%	\$143.7	32%	43%	51%
Airport	182	9%	\$88.0	10%	67	6%	\$49.5	11%	37%	56%
Seaport	142	7%	\$39.5	4%	44	4%	\$10.6	2%	31%	27%
Water	616	29%	\$95.4	11%	391	35%	\$62.8	14%	63%	66%
Building	253	12%	\$59.2	7%	153	14%	\$27.0	6%	60%	46%
Total	2096	100%	\$887.4	100%	1121	100%	\$450.9	100%	53%	51%

* Based on total Public Works Financing database, including projects with partial information

Source: AECOM Consult, Inc. "Synthesis of Public-Private Partnership Projects for Roads, Bridges & Tunnels from Around the World – 1985-2004", prepared at the request of the Federal Highway Administration, August 30, 2005, p. 4.

The predominant types of infrastructure financed or delivered through some form of PPP arrangement varies by global region based on the level of development and relative modal share of travel in each region. The largest proportion of funding is generally for road projects, with rail passenger projects the second largest user of PPP-based financing or project delivery. This is true for each region of the world, except for Africa and the Middle East, where water projects dominate. Countries in this region are generally less developed economically and in greater need of basic water delivery and treatment resources. However, even in Africa and the Middle East, road projects are the second largest proportion of PPP-financed or delivered infrastructure projects.

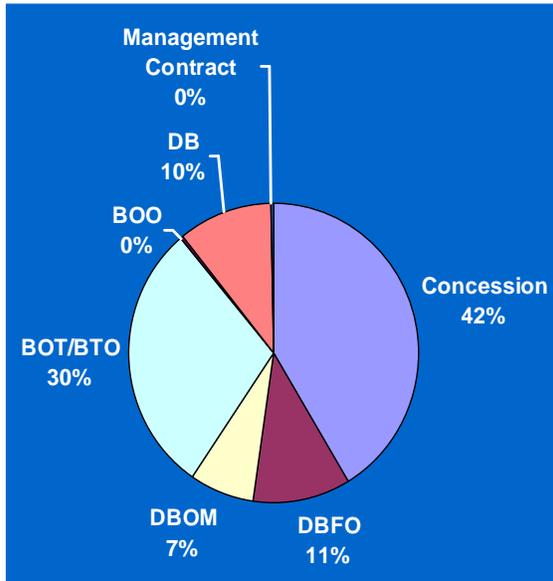
The use of PPPs for road infrastructure projects support continued economic growth in the more developed parts of the world while fostering economic development in the less developed parts of the world. In the latter case, various international funding organizations like the World Bank, the Asian Development Bank, or the Inter-American Development Bank, stimulate the use of various financial and asset management tools and techniques to promote the development of needed infrastructure projects around the world, particularly road and rail projects.

ROAD-RELATED PPP ACTIVITY AROUND THE WORLD SINCE 1985

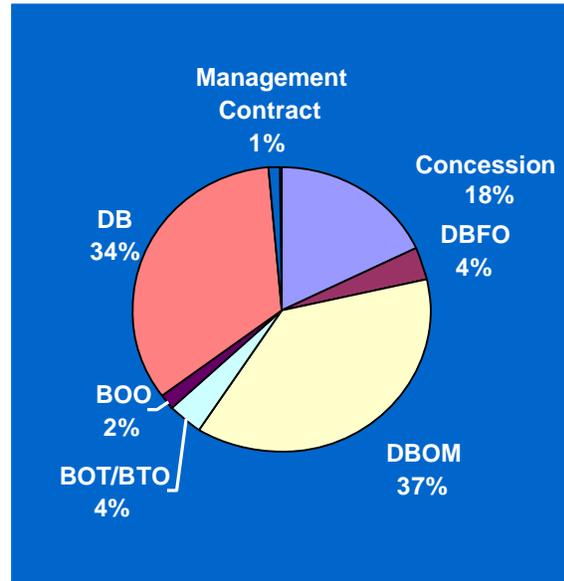
In comparison to the U.S., the use of PPPs between 1985 and 2004 has been more widespread overseas where concessions and BOT/BTO are the most widely used PPP approaches used, as shown in Exhibit 2.2 below. In addition, international spending on road-related PPP projects has been over six times the amount spent of these types of projects in the U.S. This reflects the greater level of responsibility and risk taken by the private partners involved in PPPs overseas, where the need for private capital financing is greater than in the United States which has traditionally relied on funding provided by motor fuel taxes paid into a trust fund intended solely for surface transportation capital and renewal projects.

Exhibit 2.2 Global Road-Related PPP Projects by Contract Type - 1985-2004

Global Excluding U.S. - \$281B



U.S. Only - \$42B



Source: AECOM Consult, Inc. "Synthesis of Public-Private Partnership Projects for Roads, Bridges & Tunnels from Around the World – 1985-2004", prepared at the request of the Federal Highway Administration, August 30, 2005, pp. 18 and 34.

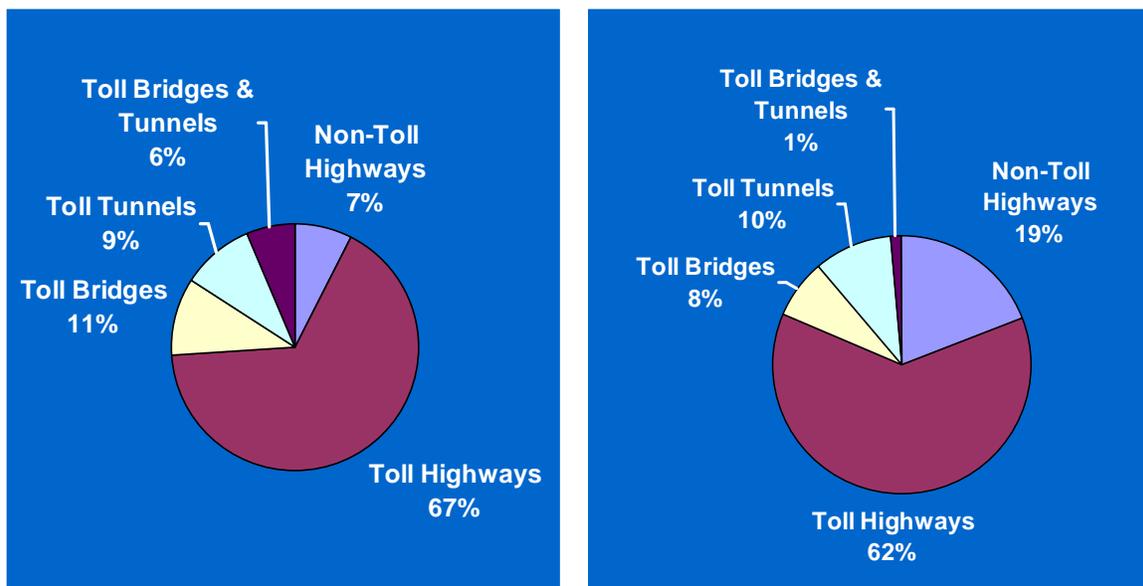
Exhibit 2.3 shows that, on average, the international community spent over two-thirds of its budget for road-related PPPs on toll highways between 1985 and 2004, with toll bridges the next largest category. In the U.S., the highest proportion of spending on road-related PPPs was also for toll highways, with non-toll highways the next largest facility type developed by PPPs during the same twenty-year timeframe. This reflects the importance of having a dedicated funding source such as tolls to support PPP projects regardless of sponsoring country.

Over the last 20 years, Europe has had the largest PPP infrastructure program in terms of road and rail project costs. Asia has had the second largest road and rail programs, although in recent years Asian countries have added significantly to their highway PPP projects. North America (Canada, Mexico, and the United States) have been third in terms of the cost of road and rail projects financed or delivered through some form of PPP arrangement. This may change as more project sponsors seek to leverage and expedite their capital improvement programs through the use of PPPs, innovative financing, and innovative project delivery.

Exhibit 2.3 Global Road-Related PPP Projects by Facility Type - 1985-2004

Global Excluding U.S. - \$281B

U.S. Only - \$42B



Source: AECOM Consult, Inc. "Synthesis of Public-Private Partnership Projects for Roads, Bridges & Tunnels from Around the World – 1985-2004", prepared at the request of the Federal Highway Administration, August 30, 2005, pp. 17 and 33.

DEFINITION AND TYPES OF PPPs

In Europe, Common Law does not provide a specific definition of a public-private partnership.¹ However, a general definition is a form of contractual agreement between a public sponsor and private provider(s) that provides for greater involvement of the private sector in the provision and financing of public infrastructure or services, with a view to improving efficiency and reducing costs. By expanding the private sector role, the public sector is seeking to avail itself of the technological, managerial, and financial resources to leverage scarce public funds and expedite the delivery of a project and/or services in a more cost-effective manner and with reduced risk to the public agency sponsor. By sharing responsibility and resources for the delivery of a PPP project, both public and private sectors can share in the potential risks and rewards from the delivery of the facility or service relative to what they retain responsibility for.²

PPPs come in a wide variety of arrangements, representing a broad spectrum of private and public sector involvement in the various phases of project development, finance, implementation, operations, maintenance, and preservation. The five major types of PPP arrangements are listed below.

¹ European Commission. "Guidelines for the Successful Public-Private Partnerships." Directorate-General for Regional Policy, Brussels, Netherlands, March 2003, p. 19.

² National Council for Public-Private Partnerships. "Public Private Partnerships Defined." <http://www.ncppp.org/howpart/index.shtml#define>

Private Contract Fee Services

For both highway and transit modes, private contract services represent the most common form of private sector involvement in surface transportation project and service delivery. For the highway mode this includes contract planning and environmental studies, facility and right-of-way maintenance, and operations, including the operation of transportation management centers and various ITS services. Transit agencies have long contracted for the operation of some or all of its modal services with the private sector, especially paratransit services for senior and persons with disabilities. In addition, many transit agencies contract for maintenance services on some or all of their vehicles, facilities, and infrastructure.

Alternative Project Delivery Approaches

In recent years surface transportation agencies have increasingly turned to PPP project delivery approaches (such as design-build or DB) in order to procure new or expanded facilities. Agencies use PPP delivery approaches in an attempt to obtain time savings, cost savings, new technology, and more innovative, higher quality projects with reduced risks.

Multimodal Partnerships.

Multimodal partnerships include transportation projects that involve more than one mode, such as park and ride lots, express lanes with Bus Rapid Transit (BRT) services, airport transit extensions, or truck/rail transfer facilities. Multimodal partnerships may or may not be PPPs, depending on whether the private sector is involved in the design, construction, operation, maintenance, finance, and/or management of the multimodal project.

Joint Development

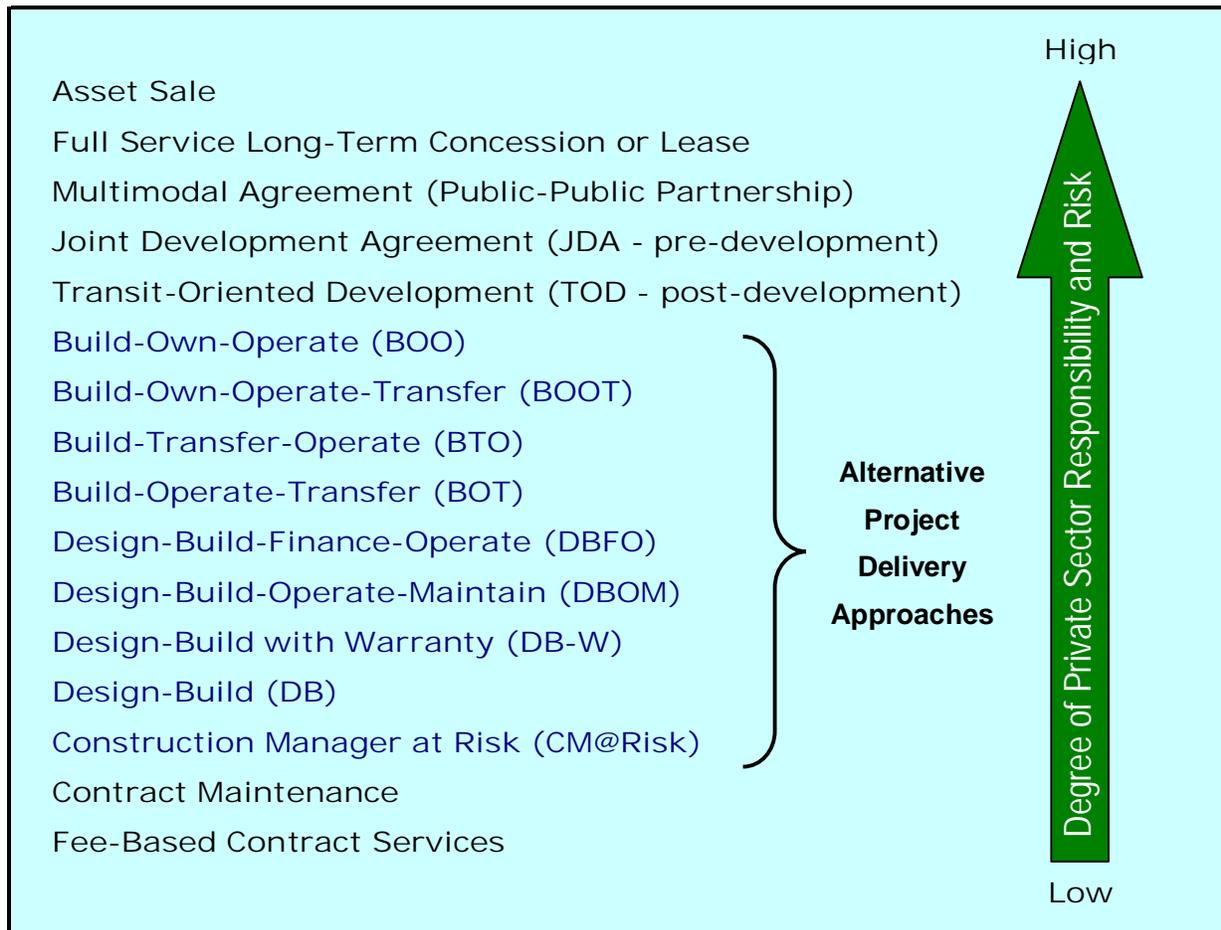
Surface transportation agencies are partnering with private developers to capture a portion of the increased value resulting from enhanced accessibility provided by proposed or recent transportation projects, often referred to as joint development or transit-oriented development (in the case of transit). Economic development-based partnerships provide access to additional capital and operating revenues for surface transportation agencies through the receipt of tax increment financing, special assessment or business improvement district fees, access fees, and increased toll or fare revenues, as well direct private sector funding of capital facilities that promote access between transportation facilities and private development.

Long-Term Lease or Concession Agreements

Concession agreements typically involve the long-term lease of publicly financed transportation facilities (such as toll roads or parking garages or air rights over transit stations or highways) to a private sector concessionaire for a specified time period in return for the right to collect the revenues generated by the facility. During the concession period, the concessionaire may be responsible for financing, developing, and delivering the project, as well as facility operation, maintenance, and preservation.

These five categories of transportation PPP arrangements, their components, and the benefits of each are described in more detail below. Exhibit 2.4 illustrates the hierarchy of major types of PPPs discussed in this chapter, starting at the bottom with PPPs that have the least private sector role and ending on the top with PPPs with the greatest private sector role.

Exhibit 2.4 Major Types of Transportation PPPs



ALTERNATIVE PPP ARRANGEMENTS

The following pages describe each of the five major types of PPP arrangements for delivering surface transportation projects, including variations where developed and applied.

Private Fee-Based Contract Services, including Contract Maintenance

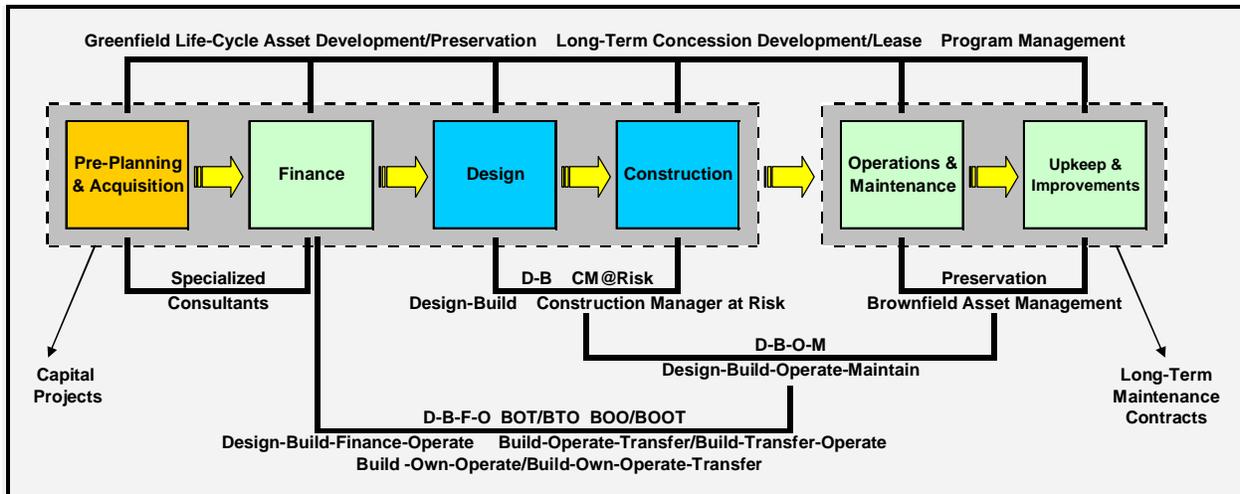
Private contract services are fee-based arrangements between public agencies and the private sector for services that are typically performed in-house, such as planning and environmental studies, program and financial management, and/or operations and maintenance. While traditionally performed by public employees, maintenance services are increasingly being outsourced to private companies. A maintenance contract assigns responsibility for facility upkeep to a private company based on specified performance standards for a certain period of time, often for five years. These contracts generally are awarded on a competitive bid process to the contractor offering the best price and qualifications. The potential benefits of fee-based private contract services include:

- Reduced work load for agency staff;
- Potential for reduced costs; and
- Opportunities to apply innovative technologies, efficiencies, and private sector expertise.

Alternative Project Delivery Approaches

Exhibit 2.5 summarizes the major phases that comprise the delivery of infrastructure projects. Different project delivery approaches can be developed by combining various phases together that the private sector takes responsibility for. The primary combinations are discussed below, starting with Design-Bid-Build which is not considered a PPP approach since it is the traditional project delivery approach used in the United States with no increase in private sector responsibilities or risks.

Exhibit 2.5 Major Phases of Infrastructure Project Development and Delivery



Source: Pekka Pakkala. *Innovative Project Delivery Methods for Infrastructure – An International Perspective*. Finnish Road Enterprise, Helsinki, 2002, p.32.

- Design-Bid-Build.** Design-bid-build (DBB) is a traditional form of project delivery where the design and construction of the facility are awarded separately to private sector engineering and contracting firms. As a result, the DBB process is divided into a two-step delivery process involving separate phases for design and construction. In the design phase, the project sponsor either performs the work in-house or contracts with an engineering and design firm to prepare the preliminary engineering plans and environmental clearance, which results in a project plan at the 30 percent completion stage, and the final drawings and specifications for the project. Once the design phase is complete, the project sponsor separately contracts with a private construction firm through a competitive bidding process. Under a DBB contract, the project sponsor, not the construction contractor, is solely responsible for the financing, operation, and maintenance of the facility and assumes the risk that the drawings and specifications are complete and free from error. The DBB selection process is based on negotiated terms with the most qualified firm for the design phase; while, the award of the construction contract typically is based on the lowest responsible bid price.

The DBB delivery approach was developed in the late nineteenth century as a way to deal with increasingly complex and specialized design and construction services; the perceived need to provide a check and balance between the development and execution of project plans; and a desire to deliver projects at a minimum cost. Many surface transportation projects still use the DBB approach.

The primary benefits associated with DBB delivery are:

- Division of work by specialization of effort (design versus construction);
- Reduced potential for collusion between the design and construction firms during the project delivery process that circumvents the contract terms; and
- Increased ability of local firms to compete for contracts which are more limited in scope and often smaller in scale.

By having separate contracts for design and construction, it is easier for smaller or specialty firms to compete with larger firms for the design or construction contracts, resulting in more bidders and frequently a more competitively priced bid.

- **Construction Manager-at-Risk.** Construction Manager at Risk (CM@Risk) is a project delivery approach in which the construction manager (CM) is brought into the project development process under separate contract during the design phase to minimize risk for all parties involved in a project by combining the experience, creativity, and skill of the engineering design and CM@Risk firms with the client's understanding of the project's requirements. In CM@Risk, the client selects the CM based on qualifications, not price, to provide constructability, technology, pricing, and sequencing analysis of the design. The CM becomes the design-build contractor when a guaranteed maximum price is agreed upon by the project sponsor and the CM.

CM@Risk includes construction management services for a project throughout the preconstruction and construction phases by a firm which is licensed as a general contractor and guarantees the cost of the project. CM@Risk is gaining popularity due to the following benefits:

- Collaboration of the client, designer, and CM to ensure a constructible design that is executed to meet the client's requirements;
 - Continued advancement of the project during price negotiations;
 - Potential for more optimal teaming because the CM can negotiate with all firms, rather than having to select from a limited number under DB delivery;
 - Higher level of direct client involvement than other alternative project development approaches (described below) during project development phases as a collaborator with the design and construction management firms; and
 - Reduced project risk by identifying design errors or omissions before they convey to the construction phase and guaranteeing the cost of project.
- **Design-Build.** Unlike DBB where the design and construction of projects is procured in two separate contracts with little or no overlap in the respective project work phases, the DB delivery approach combines the design and construction phases into one, fixed-fee contract. Under a DB contract, the design-builder, not the project sponsor, assumes the risk that the drawings and specifications are free from error. While the design and construction phases are performed under one contract, it is important to note that the design-builder may be one company or a team of companies working together. The DB selection process may be based on a negotiation with one or more contractors or a competitive process based on some combination of price, duration, and qualifications. Increasingly DB contracts are being awarded on the basis of best value, considering each

of these factors. DB is a successful, well-established process for delivering major capital projects by both the public and private sectors in many countries overseas. DB offers cost-effective project delivery in terms of schedule, cost, and quality. The primary benefits that have been associated with DB delivery approaches compared to traditional DBB delivery include the following.^{3, 4, 5}

- **Time savings** - The potential for time savings results from early contractor involvement in the design phase, which increases the constructability of the design plans; the ability to work concurrently on the design and construction phases for portions of the project; and the elimination of the bidding process between the design and construction phases that is required of traditional DBB project delivery.
- **Cost savings** - The potential for cost savings results from continued communication between design, engineering, and construction team members throughout the delivery; reduced inspection requirements by the project sponsor since the design-builder is responsible for these activities, reduced change orders due to early contractor involvement in the design phase; and shortened project timeline.
- **Shared risks** - Since the potential project risks are shared among the public and private sectors, the risks may be assigned to the party best able to handle them. For example, the private sector may be better equipped to handle the risks associated with design quality, construction costs, and delivery schedule adherence since they are responsible for both the design and construction of the facility; while, the public sector may be better able to manage the public risks of environmental clearance, permitting, and right-of-way acquisition.
- **Improved quality** - The potential for improved quality results from the involvement of the design team through the project development and opportunities to incorporate project innovations and new technology that may arise based on project needs and contractor capabilities.

DB project delivery may include a variety of structures and combinations that result in private participation only in the design and construction phases or may extend into operations, maintenance, and project financing. These variations of the DB delivery approach are discussed in greater detail below.

- **Design-Build with a Warranty.** Under the Design-Build-Warranty (DB-W) approach, the design-builder guarantees to meet material, workmanship, and/or performance measures for a specified period after the project has been delivered. The warranties may last five to 20 years. The potential benefits of the DB with a warranty approach include the assigning of additional risk to the design-builder and reducing the project sponsor's need for inspections and testing during project delivery.
- **Design-Build-Operate-Maintain.** Under a design-build-operate-maintain (DBOM) delivery approach, the selected contractor is responsible for the design, construction,

³ Loulakis, M. C. *Construction Project Delivery Systems: Evaluating the Owners Alternatives*, AEC Training Technologies, 1999.

⁴ Pakkala, Pekka *Innovative Project Delivery Methods for Infrastructure: An International Perspective*, Finnish Road Enterprise, 2002.

⁵ Tenah, K. A. "Project Delivery Systems for Construction: An Overview," *Cost Engineering*, AACE International, Morgantown, WV, 43(1), pp 20-26.

operation, and maintenance of the facility for a specified time. The contractor must meet all agreed upon performance standards relating to physical condition, capacity, congestion, and/or ride quality. The potential benefits of the DBOM approach are the increased incentives for the delivery of a higher quality plan and project because the design-builder is responsible for the performance of the facility for a specified period of time after construction is completed.

- **Design-Build-Finance-Operate.** The design-build-finance-operate (DBFO) delivery approach is a variation of the DBOM approach. The major difference is that in addition to the design, construction, and operation of the project, the contractor is also responsible for all or a major part of the project's financing. The potential benefits for the DBFO approach are the same as those under the DBOM approach and also include the transfer of the financial risks to the design-builder during the contract period. While the project sponsor retains ownership of the facility, the DBFO approach attracts private financing for the project that can be repaid with revenues generated during the facility's operation.
- **Build-Operate-Transfer / Build-Transfer-Operate.** Build-operate-transfer (BOT) is similar to the DBFO approach whereby the contract team is responsible for facility design, construction, and operation for a specified time, after which project ownership and operation is returned to the project sponsor. Under a BOT approach, the project sponsor retains facility ownership as well as the operating revenue risk and any surplus operating revenues. Under the similar Build-Transfer-Operate (BTO) approach, asset transfer occurs after construction with the private provider continuing to operate the facility under the BTO contract. The potential benefits of using a BOT or BTO approach are similar to the benefits associated with using a DBOM contract: increased incentives for the delivery of a higher quality plan and project because the contractor is responsible for the operation of the facility for a specified time period after construction.
- **Build-Own-Operate / Build-Own-Operate-Transfer.** Under a build-own-operate (BOO) delivery approach, the design, construction, operation, and maintenance of a facility is the responsibility of the contractor. Under the similar Build-Own-Operate-Transfer (BOOT) approach, asset transfer occurs after a specified operating period when the private provider transfers ownership to a public agency. The major difference between BOO and DBOM, DBFO, BOT, and BOOT approaches is that ownership of the facility remains with the private contractor. As a result, the potential benefits associated with a BOO approach are that the contractor is assigned all operating revenue risk and any surplus revenues for the life of the facility.

Full Service Delivery or Program Management

With a full delivery approach, the construction contractor provides a wide variety of services beyond construction to the project sponsor. These services generally begin during the design phase and may continue through the operation and maintenance of the facility. The potential benefit of the Full Service Delivery approach is that it allows the project sponsor to leverage its resources throughout the design, construction, and operation of the facility. A primary form of full-service delivery is the Long-Term Concession or Lease Agreement.

Long term concession or lease agreements involve the lease of publicly financed facilities to a private sector concession team which provides full facility services for a specified time period. Under the concession lease, the private sector team agrees to pay an upfront fee to the public

agency in order to obtain the rights to collect the revenue generated by the facility for a defined period of time (usually from 25 to 99 years). In addition to the concession fee, the concessionaire agrees to operate and maintain the facility, which may include capital improvements in some instances. Long term lease agreements are awarded based on a competitive process to a qualified bidder with the best bid price. In 2006, the major toll highways in France were transferred to private concessionaires offering the highest price for each of the four systems which were previously operated by quasi-governmental companies.

The potential benefits of long term lease agreements include:⁶

- Transferring responsibility for increases in user fees to the private sector;
- Generating large up-front revenues for the public agency;
- Transferring operations, maintenance, and capital improvement responsibilities to the private sector;
- Transferring most project risks to the private concessionaire; and
- Taking advantage private sector efficiencies in operations and maintenance activities.

There are many governments and transportation agencies considering long-term leases or concession agreements to take over responsibility for existing facilities (brownfield projects such as in the case of the French toll highways) or to develop new facilities (greenfield projects, a number of which are presented as case studies in subsequent chapters of this report). In Europe and Asia, transportation projects involving private financing are delivered using the concession or BOT/BTO project delivery approaches.

Transit Related Development Approaches

Transit related development is viewed differently by different agencies and regions depending on the status of the transit facility when the development is committed. However, the common thread between all of these definitions is that transit related development involves pedestrian-friendly, higher-density development near transit facilities. Within the transit industry, transit related development is generally defined as “a pattern of dense, diverse, pedestrian-friendly land uses near transit nodes that, under the right conditions, translates into higher patronage.”⁷ Transit related development typically includes higher density residential, commercial, and/or retail developments within a ¼- to ½-mile radius of transit stations and stops. Mixed use development is a common element of transit related development.

Transit related development can provide financial support for transportation infrastructure through four formalized development opportunities:

- Transit-Oriented Development;
- Joint Development;
- Business Improvement Districts; and
- Tax Increment Financing.

⁶ Federal Highway Administration PPP website, www.fhwa.dot.gov/ppp.

⁷ Cervero, Robert (Principal Investigator). *TCRP Report 102: Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects*. Transportation Research Board, 2004, p.7.

These opportunities are discussed in greater detail below.

- Transit-Oriented Development.** Transit-oriented development (TOD) is commercial and residential development that is a consequence of proximity to an existing or recently opened transit station or terminal. TODs may involve the partnership of private developers with local governments, development agencies, and transit agencies in order to enhance the land use surrounding a transit facility. Transit agencies or local governments frequently own land located near existing or future transit facilities that is not being used, or could be put to a higher use. Developers are continuously looking for new development opportunities, and the location of available land with good access to transit is attractive for new development or re-development. With TOD, the private developer is solely responsible for the financing and risks associated with constructing the development on publicly owned land. Local governments may also play a role beyond that of land owner; they can provide incentives to developers in the form of density bonuses, rezoning, relaxing parking requirements, and streamlining regulatory requirements. It takes the commitment, communication, and coordination of all these public and private groups to make TOD successful.

The benefits of TOD are quite varied and extend well beyond transit usage. Exhibit 2.6 summarizes the primary and secondary benefits from the perspective of the public and private sectors.

Exhibit 2.6 Public and Private Sector Benefits and Risks of Transit-Oriented Development

Public Sector – Primary Benefits/Risks	Private Sector - Primary Benefits/Risks
Increased ridership and fare revenues	Higher land values
Joint sharing of costs for mixed-use stations	Higher rental/lease rates and sales prices
Potential for dedicated property/sales tax revenue	More affordable housing opportunities
Potential for lease payments or other development-related revenues	Risk of development market decline negating value of developer investment in transit project
Risk that private development revenues fail to accrue due to delays in development activity	Risk of commercial development delays caused by transit project delays
Public Sector – Secondary Benefits/Risks	Private Sector – Secondary Benefits/Risks
Revitalized neighborhoods and commercial zones	Higher retail sales from greater customer exposure
Reduced traffic congestion and suburban sprawl	Increased access to labor
Reduced need for roads and other infrastructure	Reduced parking costs in suburban locations
Reduced crime and increased safety resulting from rejuvenated urban landscape	Risk that transit service levels do not match needs of development lessees, patrons, or residents
Risk of development requirements requiring costly changes to transit facility designs and operations	Risk of mismatch between transit patrons and retail or residential customers of related development

Source: Robert Cervero, TCRP Report 102: Transit-Oriented Development in the United States, TRB, 2004, pp.120-131. Revised by AECOM Consult, Inc. to reflect risk factors. 2007

- **Joint Development Agreements.** In a joint development agreement (JDA) a transit agency works directly with a private developer in planning and executing a project, prior to its completion. A JDA is project specific, dealing with the development on, above, or adjacent to land owned by a transit agency. With joint development, the transit agency provides developers with the right to design and construct a residential, commercial, retail, or mixed use building on or above transit property in return for a negotiated payment. Developer payments to transit agencies vary significantly and may include an annual lease payment for a specified period of time as well as the construction of transit facilities, such as portals to transit facilities, parking facilities, and station facility improvements.

The form of joint developer payments are project specific and depend on the benefits and needs of the developer and transit agency. The many forms of payment arrangements include:⁸

- **Ground Lease** - A ground lease involves an annual rent payment to the transit agency for the right to develop property owned by the transit agency. The length of the lease agreement must be long enough for the developer to receive an acceptable return on investment from the rents it charges to the occupants of the development. When the lease expires, ownership returns to the transit agency.
- **Air-rights Lease** - An air-rights lease is similar to a ground lease in that it involves an annual rent payment to the transit agency for an agreed upon period of time; however, the lease is for the right to build the development above the transit station. The length of the lease agreement must be long enough for the developer to receive an acceptable return on investment from the rents it charges to the occupants of the development. When the lease expires, ownership returns to the transit agency.
- **Operations Cost Sharing** - Operations cost sharing involves the sharing of certain operations costs between the transit agency and the development. Common examples include ventilation systems, parking, and utilities.
- **Construction Cost Sharing** - Construction cost sharing involves the developer paying for portions of the transit agencies construction costs, such as parking facilities, building foundations, access portals, transit centers, and bus shelters. Construction cost sharing is one type of joint development that is easily applied to bus service as well as rail.
- **Station Connection Fee** - A fee (may be one-time or annual) charged by transit agencies to a developer for the right to connect its development directly to the transit station. The connection allows riders direct access to properties without having to go outside the transit station.
- **Negotiated Private Contribution** - Transit agencies negotiate directly with developers to receive private contributions to transit facility improvements. The value of the contributions is based on the benefits received by the private

⁸ Cervero, Robert (Principal Investigator). *TCRP Report 102: Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects*. Transportation Research Board, 2004, pp.25-32.

developer from the transit investment. These contributions are generally a one-time payment.

- **Benefit Assessment District** - A geographic benefit district is established around a transit station. Property owners within the benefit district are then assessed a fee based on the benefits they receive from the transit facility or improvement to help finance its construction. Residential properties are frequently exempted from the assessment.
- **Equity Partnership** - Equity partnerships involve the exchange of certain assets between the transit agency and the developer, such as a land sale. Some joint development agreements enable transit agencies to keep land sale proceeds, particularly if the development is supportive of public transit.
- **Incentive Agreement** - Incentive agreements involve the developer contributing or sharing the costs of transit investments, such as station connections or improvements, in return for density bonuses that allow the developer to add additional floors or space to their development, rezoning of property, or relaxing parking requirements.

The primary benefits of JDAs for public transit agencies include increasing agency revenues through increases in ridership, the generation of lease payments, capital or operating contributions, or one-time fees, as described below:

- The mixed use development at transit stations attracts additional riders to the transit system, thereby increasing fare revenues;
- JDAs may generate private sector capital and operating contributions as well as annual lease payments for transit agencies. These additional annual revenues and capital and operating contributions diversify transit agency funding and help offset some of the agency's on-going capital and operating expenses.

In addition to the revenue benefits, JDA offer other secondary benefits or societal improvements, including:

- Increased economic activity and vitality of station areas;
- A safer environment around transit stations or terminals; and
- A more aesthetically pleasing place to live, work, and visit near transit stations or terminals.

These benefits may be secondary for transit agencies, but they are the primary benefits for private developers. Without these economic, safety, and attractiveness benefits, the private developers would not be interested in participating in joint development activities because the developer would not be able to attract the residential, commercial, and retail tenants necessary to make their investment profitable.

- **Business Improvement Districts.** Business Improvement Districts (BIDs) assess properties located within a defined geographic area to finance a variety of enhanced services in the area including security, maintenance, marketing, economic development, parking, transportation, and special events. BIDs usually are managed by a quasi-public agency or a nonprofit organization under the direction of a board composed of representatives from the various business and property interests within the district.

Historically, BID transportation projects have focused on pedestrian facilities and movement within the district; however, as accessibility and congestion levels increase and impact economic development, BIDs have started to take on a greater role in transportation planning and initiatives. In some areas, BIDs have contributed to the financing of new or expanded transportation services in order to enhance the economic activity and growth in the district. In addition, some BIDs have sponsored transportation enhancements or improvements to take advantage of available government grants to fund transit project costs.

If the businesses and property owners within BIDs understand the benefits of transportation programs on economic activity and property values in the district, BIDs are more likely to contribute funding to transportation projects. In new developments, transportation initiatives offer the ability to provide better access to the district, generating more traffic and economic activity. Additionally, as congestion levels increase in existing districts, transportation improvement initiatives can move more people more efficiently through the district and increase economic activity. From the public transportation agency perspective, the potential benefits of including BIDs in transportation infrastructure projects include:

- Providing access to property tax assessment revenues;
 - Increasing revenue diversification;
 - Creating partnerships with businesses and property owners within the district; and
 - Coordinating transportation services with other services provided by the BID.
- **Tax Increment Financing.** Tax Increment Financing (TIF) is a tool used by municipalities to help finance the redevelopment of areas within a community through increased property taxes from the enhanced value of property (both developed and undeveloped) resulting from the implementation of infrastructure and service improvements. Localities may establish TIFs with the approval of property owners in the district. A TIF district is usually administered by local government officials or a quasi-public agency with the direction of a board or commission that makes the decisions on how and where the revenues will be applied. Tax increment financing uses the future increases in property tax revenues to finance current infrastructure investments (including transit and other transportation facilities). The idea behind the TIF is that the infrastructure investments will increase the value of existing property within the district as well as encourage new development that expands the tax base. As a result, private investors are willing to provide upfront capital for these investments because the debt service will be repaid through the increase in future property tax revenues.

A TIF does not increase the property tax rate in the district; rather, it dedicates a portion of future growth in the district's property tax revenues due to an expanded tax base for a specified time period (usually 20 to 25 years) to meet the debt service payments for the infrastructure investment. The primary benefits associated with using TIF to fund transportation investments include:

- Providing access to capital financing markets with a dedicated revenue stream for debt repayment; and
- Providing access to new revenues without increasing taxes.

Multimodal Partnerships

Multimodal partnerships provide opportunities to combine the development, financing, and/or operation of facilities that serve more than one transportation mode, including transit, passenger rail, highway, and airports. With the passage scarcity of public funding, there has been increasing interest in multimodal development and the coordination of projects across modes. As transportation needs and connectivity requirements continue to increase in the places like the European Union, China, and South America, successful multimodal partnerships will be essential components in improving transportation efficiency, market competitiveness, service quality, responsiveness to public needs, aesthetic appeal, and financial feasibility.

Multimodal partnership projects do not have to be PPPs. Some may be PPPs involving several public and quasi-public agencies. However, the opportunities for private sector involvement in multimodal partnerships are an area of potential growth for transit-related PPPs, particularly when toll roads and airports are involved due to the ability to leverage toll and airport revenues for transportation investments.

The primary results of multimodal partnerships include the ability to combine the strengths of each partner. By involving other public transportation agencies as well as private sector partners, multimodal projects have improved access to:⁹

- More diverse revenues and financial markets to fund transportation investments;
- Increased economic development opportunities;
- Increased ridership;
- Commuter time savings; and
- Efficiencies in the operation of all involved modes.

BENEFITS OF PPPS

In many countries overseas, PPPs have demonstrated the ability of the government to reap the benefits of private sector involvement in infrastructure procurement while meeting community obligations and retaining control over potentially important public assets. These and other potential benefits of PPPs are described below.

Stronger Working Relations

In comparison to shorter-term procurements methods, PPPs provide the opportunity for public sector agencies and private sector providers to develop long-term, high trust relationships. With the need to concentrate on long-term objectives, there is greater incentive for public sponsors and private providers to understand goals and share information to develop better long-term solutions. Further, the opportunity to develop strong long-term relationships provides a better forum in which to resolve problems and issues.

With transportation assets typically having long effective lives, a need exists for the public sector to develop a long term relationship with a provider to assist the development of transportation

⁹ Hauser, Dr. Edd, P.E., Principal Investigator. *Volume III: Developing and Maintaining Partnerships for Multimodal Transportation Planning*. NCHRP Web Document 22, Project 8-32(41), June 1997, p.42.

infrastructure, guide capital expenditure decisions and ensure that assets are maintained, safe and are of high quality upon transfer.

However, the development of a long-term relationship will need to account for the possibility that there may be a reduced desire on a provider's part to seek the best solution due to the security of the relationship. Public sponsors will also need to be mindful of the partnership proposing and selecting options that minimize damage to the relationship, but may not maximize community benefits.

Reduction of Financial Constraints

Many projects proposed by public entities are postponed or do not proceed due to limited financial resources, and in particular, the provision of upfront capital. PPPs provide an advantage with respect to financing by allowing the private sector to finance projects using private funds, in effect providing a form of off-balance sheet financing for public agencies. In turn, financing commitments from the private sector often bring forward the development of projects that may otherwise not proceed due to a lack of capital.

Faster Delivery

PPPs can expedite the financing and delivery of transportation projects through the involvement of the private sector in these phases of a project, that lower project costs by avoiding inflationary cost increases, applying best practices and new technology, and transferring more technical and other risks to the private sector which is often better able to manage these risks. The private sector has an incentive to minimize construction delays in order to minimize costs and bring forward their revenue stream. Contract conditions including early completion bonus payments and the inclusion of the construction period within the concession period can provide further incentives to bring forward delivery.

Innovation and Expertise

Private sector involvement encourages the development of new and creative approaches to financing, economies of scale, development, implementation and operation/maintenance. The private sector can also offer expertise in project, operational and risk management. In particular, financial markets have become savvy in the methods that they use to structure finance to suit infrastructure projects through the use of stepped margin and indexed bonds.

Greater Cost Efficiency and Productivity

The private sector has an incentive to ensure its operations are as cost efficient as possible. In particular, the private sector is often better at managing third-party usage of facilities, thus reducing the net cost of a facility to transportation agencies. A private operator would also be motivated to increase the productivity and return from assets, with greater interest in implementing practices such as yield management and demand management when limited capacity exists and is expensive to create.

Integration of Project Development and Delivery

The potential integration of design, construction, maintenance, and operation provides incentives for the private sector to optimize expenditure and maximize innovation to achieve the greatest level of cost efficiency over the life of the asset through a life-cycle approach to asset delivery rather than minimizing the cost of a specific part of the asset lifecycle e.g. construction costs.

Greater Choices

Project sponsors can match specific types of PPPs to individual projects based on their characteristics and the capabilities and needs of public sector sponsors and private sector providers. This model was successfully used in Hong Kong before being incorporated into China when a number of transportation infrastructure projects were developed, each using a different project delivery approach (DB, DBOM, DFOM, BTO, etc.), based on the nature of each project and the interests and risk tolerance of the participating members of the partnerships.

Increased Competition

PPPs also can enhance competition in how highway facilities and services are provided from a functional, organizational, technological, and process perspective by engaging the private sector through properly transparent contracting procedures that can leverage public sector capabilities.

Risk Management

PPPs allow public sponsors to share project risks with the private sector. In the risk sharing process, public sponsors can pass risks that may be more effectively managed by the private sector while retaining risks where it is in a better position to manage them or deal with their consequences. For instance, the private sector may be more effective in managing the variance in construction, operating, and maintenance costs while public agencies may be more effective in managing public liability, environmental clearance, and permitting risks.

RISKS OF PPPS

While providing a variety of advantages, there are also risks to consider when using PPPs for transportation projects. The many categories of project risks are listed below in Exhibit 2.7.

Exhibit 2.7 Types of Risks Associated with Transportation Infrastructure Project PPP

• Demand/volume	• Compensation and termination clauses
• Revenue	• Changes of law
• Environmental/archeological	• Economic shifts
• Regulatory/contractual	• Currency/foreign exchange
• Payment structure/mechanism	• Taxation constraints
• Transaction cost	• Moral hazard
• Construction cost	• Loss of control of assets
• Maintenance cost	• Political stability
• Life-cycle cost	• Protectionism
• Liability/latent defects	• Public acceptance

Beginning on the next page, Exhibit 2.8 indicates potential consequences of a number of these key risk factors for members of a PPP and suggests ways to mitigate these results. Several of these risk categories are discussed in more detail following Exhibit 2-8.

Exhibit 2.8 Consequences and Mitigation Strategies for Major Types of PPP Project Risks

Risk Category	Description	Consequence	Mitigation
Site Conditions	<ul style="list-style-type: none"> Existing structures may be inadequate. Contamination of site. Necessary approvals may not be obtained. 	<ul style="list-style-type: none"> Additional construction costs and time delays. Clean up costs. 	<ul style="list-style-type: none"> Commission studies to investigate suitability of site and structures Private sector to incorporate risk through refurbishment during construction phase.
Design, Construction and Implementation Risk	<ul style="list-style-type: none"> Facility incapable of delivering at the anticipated costs. Physical or operational implementation tests cannot be completed 	<ul style="list-style-type: none"> Increase in recurrent costs, delays. Delayed/lost revenue. 	<ul style="list-style-type: none"> Seek reputable constructors with strong financial credentials. Private party may pass risk to builder/architects while maintaining primary liability. Link payments to progress.
Financial	<ul style="list-style-type: none"> Interest rate risk. Financing unavailable. Contingent funding requirements 	<ul style="list-style-type: none"> Increased project cost. Non-completion of construction. 	<ul style="list-style-type: none"> Interest rate hedging. Financial due diligence. Bank/capital guarantees from finance companies.
Operating	<ul style="list-style-type: none"> Inputs, maintenance may yield higher costs. Changes to government requirements with respect to facility operations. 	<ul style="list-style-type: none"> Increase in operating costs. Adverse effects on quality and service delivery. 	<ul style="list-style-type: none"> Long-term supply contracts where quality/quantity can be assured. Upfront specification by public sponsoring agency.

Exhibit 2.8 Consequences and Mitigation Strategies for Major Types of PPP Project Risks
- continued

Risk Category	Description	Consequence	Mitigation
Market	<ul style="list-style-type: none"> • Fluctuations in economic activity on demand • Competition, demographic change and inflation. 	<ul style="list-style-type: none"> • Lower revenues. • Diminution in real returns to the private party 	<ul style="list-style-type: none"> • Private operator to seek an availability payment element to minimize impact on risk premium. • Review likely competition for service and barriers to entry.
Legislative	<ul style="list-style-type: none"> • Additional approvals required during the course of the project cannot be obtained. • Changes in laws and regulation 	<ul style="list-style-type: none"> • Further development or change in business operation may be prevented. • Increase in operating costs with regards to complying with new laws 	<ul style="list-style-type: none"> • Private sector to anticipate requirements. • Public sponsor may mitigate such change by monitoring and limiting changes which may yield adverse consequences.
Asset Ownership	<ul style="list-style-type: none"> • Loss of the facility upon premature termination of lease or other project contracts upon breach and without adequate payment. • Different residual value to that originally calculated 	<ul style="list-style-type: none"> • Loss of investment of private party • Possible service disruption as additional capital costs incurred to upgrade the asset to the agreed value and useful life. 	<ul style="list-style-type: none"> • Private party will be given cure rights to remedy defaults. • Public sponsor may make payment for value in the project on a cost to complete basis if termination occurs pre-completion. • Impose on the private party maintenance and refurbishment obligations. • Secure services of a reputable maintenance contractor, with strong financial credentials.

Transaction Costs

Significant transaction costs can be incurred by public entities procuring a PPP, with PPP arrangements tending to be highly complex. Transaction costs are incurred by both public sponsors and potential private sector providers at the procuring stage while preparing and negotiating a PPP. When a PPP is awarded, additional costs may be incurred to monitor performance to ensure that a PPP agreement is being adhered to.

The impact of transaction costs can be reduced by providing the private sector opportunities to participate in projects that have scale, in terms of time and expenditure. Public agencies in Australia vary in their views of the appropriate minimum project value required before a PPP becomes worth pursuing. The Victorian Treasury recommends a project value of at least A\$10 million while New South Wales Treasury recommends a project value of at least A\$20 million. On the other hand, the Queensland Government considers A\$250 million as a minimum.

The impact of transaction costs can be mitigated through a variety of methods: decreasing administration complexity, standardizing PPP procurement procedures, combining a series of smaller scale projects, and increasing the lease period of a contract.

Potential Higher Life-Cycle Costs

The private sector provider may require a higher rate of return than the public sector sponsor to cover the uncertainty of longer-term life-cycle cost risks, particularly when it is unable to diversify its risk across a portfolio of projects. The premise of lower overall costs, which is a key benefit of PPPs, is highly dependent on the innovation, scale, and expertise of the private sector, with cost savings outweighing the risk premium required by the private sector.

Taxation Constraints

Some government sponsors of transportation PPPs exempt concessionaires from certain taxes due to the public service nature of the assets they provide and operate, while others are not so generous. For example, in Australia leasing provisions within the Commonwealth Income Tax Assessment Act (Sections 51AD and Division 16D) may deny private sector asset owners asset-related tax deductions. This legislation was originally introduced to combat tax avoidance. However, the legislation has had the effect of limiting the ability of private entities to claim infrastructure related expenditure as a tax deduction, if the asset was seen to be controlled by a public agency. This constraint has limited the incentive for private sector entities to invest capital for infrastructure related projects. Changes to the Income Tax Assessment Act to address these concerns have been pending for some time. Selecting project delivery methods that transfer ownership to the private sector have mitigated uncertainty with respect to tax concessions. It is for this reason that consortia within Australia pursue built-own-operate-transfer (BOOT) contracts over built-operate-transfer (BOT) arrangements.

Moral Hazard

Governments have an incentive to minimize political fallout from a PPP that is failing by covering some of the losses of the private partner in order to ensure that the project is delivered. Private sector proponents' awareness of this propensity of governments to avoid political fallout may result in them under costing risks with the knowledge that the public sector may provide financial support.

Loss of Control over Assets

PPPs potentially transfer control of assets to the private sector, limiting the ability of the public sector to provide community service obligations for the duration of the PPP arrangement. Government entities will need to ensure community service obligations are explicitly noted in PPP contract arrangements to ensure that community service obligations are met.

The loss of control over assets to the provider is a considerable concern if the sponsoring agency wishes to develop competing infrastructure in the future and may be prohibited from doing so due to non-competition clauses in the concession contract agreements to reduce the risk of traffic diversion from the tolled facility. A number of instances have been cited in Australia where the public sector has been suspected of not being able to improve competing alternate toll-free routes and public transit route to ensure that they comply with “non-compete” clauses within various toll road PPP agreements. In 2006 one concessionaire convinced the local government to close several competing local roads to through traffic to force drivers to use the tolled facilities, which were lagging traffic and revenue expectations.

CRITICAL SUCCESS FACTORS

A PPP will need to improve service quality as well as promote social and economic development if it is to have the best chance of succeeding. The following indicates what is considered to be the ‘critical success factors’ of PPPs.

Stakeholder Consultation and Support

Stakeholder consultation increases in importance if the potential impacts affect employees and the community. Experience with respect to PPPs has shown that there are misconceptions of PPPs, in particular, the perception that PPPs seek to privatize public assets. Stakeholder consultation should be used to understand opinions and address misconceptions about the proposed PPP and its value to the public. There may be a need to commit to ongoing stakeholder consultation, particularly if the duration of the PPP proposed is long. This includes on-going public outreach and communication.

Public Sector Involvement

Once a partnership has been established, the public agency sponsoring the project must remain actively involved in the project. Ongoing monitoring of the performance of the partnership is important in assuring its success, particularly with respect to safety and maintenance. The nature and frequency of monitoring should be stipulated in the contract.

Political Leadership

A successful partnership requires strong political leadership. Senior public officials must be willing to be actively involved in supporting the concept of PPPs. Officials need to be well-informed with respect to potential benefits. A political leader can play a critical role in minimizing misperceptions about the value to the public of a PPP and serving as a highly visible champion for the project, such as London’s mayor with respect to the Central London Congestion Charging PPP Program. Lack of senior political support can doom a PPP project even if otherwise justified.

Limited Complexity

PPP arrangements should be kept as simple as possible. Complexity of a PPP may result in higher transaction and monitoring costs and fewer bidders.

Secure Public Control

In a situation where contracts are not complete, Government should ensure that it has some recourse rights to maximize the opportunity to resolve and take control if the private partner defaults on its obligations to ensure the continued delivery of services to the community. Recourse rights are particularly important where contract arrangements are incomplete.

Appropriate Risk Sharing and Rewards

As noted above, one major attribute of PPPs is the opportunity to share risks between the public and private sectors. However, it is imperative that the risks are shared appropriately with associated rewards. There is a need to identify the types of risks, the party best addressed to mitigate the risk and the premium required to compensate for the risk. An inappropriate transfer of risks potentially will result in a significant increase in the premium demanded by the private sector and the probability of provider default, as noted earlier in Exhibit 2.6.

Over the course of a PPP, the various kinds of risks will need to be considered by all parties to the PPP with a clear understanding of the extent to which partnership members are responsible for particular risk factors. Flexibility or risk-sharing in the PPP contract can have a significant impact on the bid prices provided by private sector teams, with both approaches likely to result in a lowering of the bid prices received.

Effective Working Relationships among Partners During/After Contract Negotiations

New business relationships are required when PPP approaches are used to deliver projects, often with larger national or international firms that can handle the increased risk and responsibility of a PPP contract. This, in turn generates competition and fairness concerns, both for the government (which must worry about attracting a sufficient number of bids for the contract) and for smaller contractors (who may feel unable to compete in the new environment). In addition, the scope and complexity of negotiations between the government and its contractors can increase significantly, as the allocation of risk, the acceptable rate of return, and the contract incentives must be carefully defined.

Legal Authority

A number of legal issues must be considered when deciding whether and how to proceed with a transportation infrastructure PPP. The legal authority to use PPPs to expedite delivery of a needed transportation project is based on prevailing statutes and regulations established by the responsible legislative bodies and regulatory agencies. Exhibit 2.9 lists some of the many legal issues that can be resolved through flexible legislative and regulatory actions, giving the sponsoring agency and private provider the legal authority to advance the project in a timely manner, free of significant legal challenge.

Exhibit 2.9 Legal Issues Associated with Transportation Infrastructure Project PPPs

- | | |
|---|--|
| <ul style="list-style-type: none"> • Legal capacity of parties and legal requirement of the sponsor to provide services • Ability of the private sector to be involved in infrastructure development, particularly foreign companies • Ability of the private sector to acquire and own public-use infrastructure, especially foreign firms • Existence and legal basis of cost recovery and tolling • Ability to provide performance guarantees • Property issues of land acquisition – condemnation, use, and disposal • Administrative coordination • Dispute resolution and liability provisions • Special provisions associated with the use of public funds | <ul style="list-style-type: none"> • Competition and anti-collusion regulations • Currency and profit repatriation rules • Public sector borrowing restrictions • Tax and accounting liabilities • Adequacy of procurement and selection procedures • Contract provisions • Property and intelligent property laws regarding proprietary technologies and transfer of know-how • Adequacy of oversight and monitoring procedures • Authority of other public entities over infrastructure assets and access to them • Authority to regulate services • Ability and restrictions over transfer of private sector contract responsibilities to other parties |
|---|--|

Other Key Success Factors for Transportation Project PPPs

In addition to the factors cited above, other critical factors include the following:

- Demonstrated transportation need (congestion relief, safety improvement, accessibility, travel time reliability, etc.);
- Willing public and private sector partners with mutually complementary interests; and
- Adequate funding or revenues dedicated to the project to make it financially viable relative to the criteria of rate of return on investment for the public partner(s) and a reasonable sharing of scarce public funding if available.

Each of these features must be present for a transportation project PPP to be successfully developed and implemented

* * * * *

The next three chapters of this study present case studies and cameo descriptions of actual transportation infrastructure projects developed and implemented through PPP arrangements in England, Australia, New Zealand, and other countries which have increasingly turned to PPPs as a way to expedite the financing and delivery of needed surface transportation facilities around the world.

3. TRANSPORTATION PPP CASE STUDIES FROM ENGLAND

This chapter provides an overview of the introduction and use of public-private partnerships to expedite the development and financing of major highway facilities in England since the initiation of the Government's Private Finance Initiative (PFI) in 1992. This is the strategic network of highways used to move people and freight around the country, as shown in Exhibit 3.1 on the next page. It also includes a comprehensive list of PPP projects by contract type and status, as well as a number of specific project case studies.

Public-private partnerships in England have primarily been used to expedite the expansion to the nation's motorway and truck road system, including highways, bridges, and tunnels. Most of the PPPs for roadways in England have had private concession teams design, build, finance, operate, and maintain the facilities with the Government's Department of road projects. PPPs have also been used in England to manage urban congestion (such as the Central London Congestion Pricing Scheme), maintain and refurbish public transit infrastructure (such as the London Underground), and build large-scale intermodal tunnel facilities, such as the rail tunnel under the English Channel (the "Chunnel").

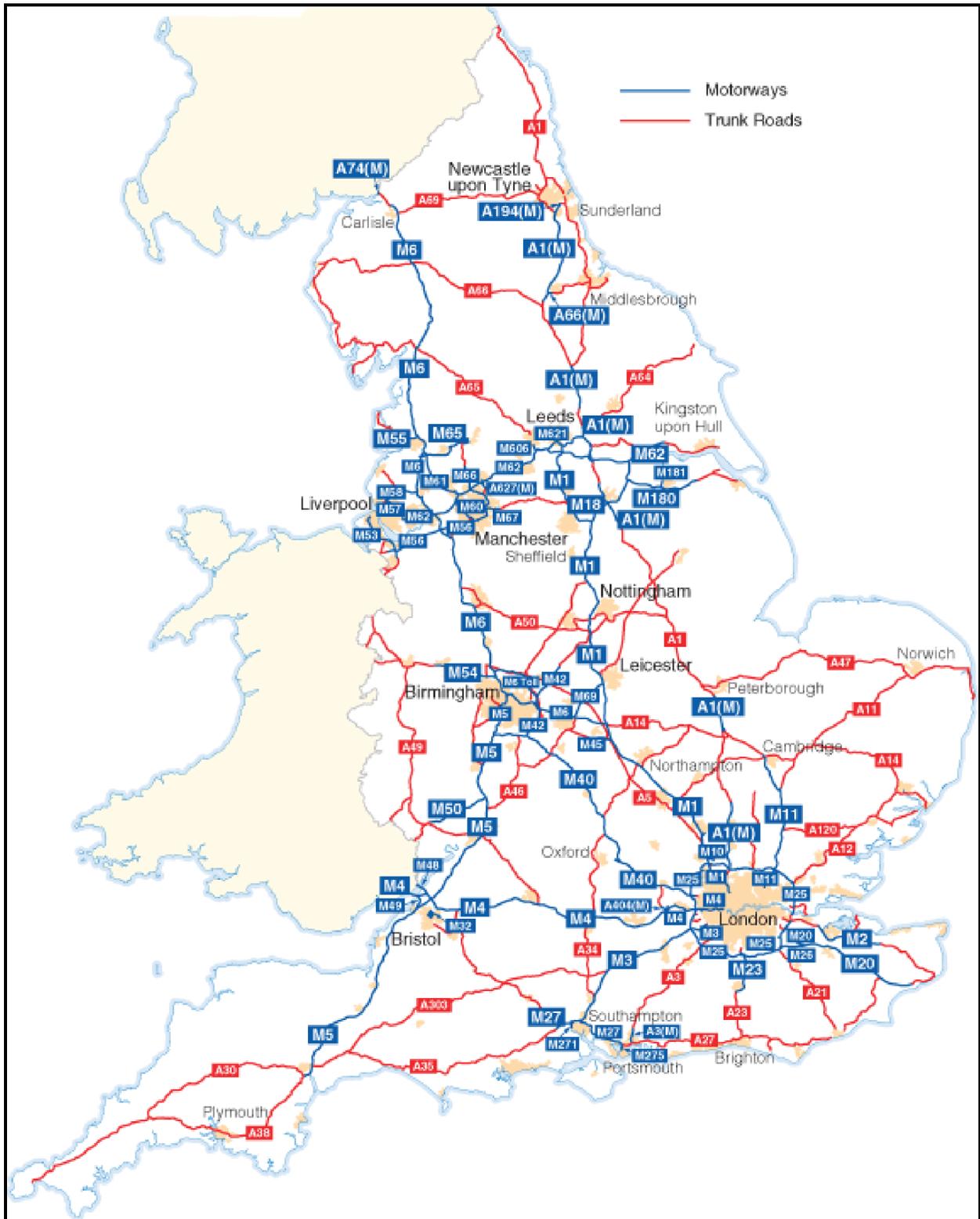
HIGHWAY SYSTEM OVERVIEW

The Highways Agency, an Executive Agency of the Department for Transport (DfT), is responsible for operating, maintaining and improving the strategic road network in England on behalf of the Secretary of State for Transport. The Agency administers the strategic road network (shown on the next page as Exhibit 3.1) as a public asset, including overseeing through private Managing Agents contractors who design and build roadway extensions and expansions. The Highways Agency is also responsible for managing the traffic using these roads, leveraged through concessionaires who operate their franchised facilities. Other roads in England are managed by local authorities.

The Highways Agency manages England's strategic network by dividing the country into fourteen areas, each of which is assigned an Area team and a general engineering contractor, known as a Managing Agent (MA) or Managing Agent Contractor (MAC). Each Area team and corresponding Managing Agent is responsible for the maintenance of the Agency's roads in their area. Area teams are part of Traffic Operations Directorate. Managing Agents serve as general engineering consultants who support the Area teams in developing preliminary design plans and overseeing the technical work of project design and construction contractors.

Prior to the mid-1990s, the Highways Agency used traditional public funding sources and unit priced-based project delivery approaches to provide for the construction and maintenance of major motorways and trunk roads in England, with a Managing Agent engineering firm serving as general engineering consultant for project development. Construction and maintenance included advanced planning, design and building of new roads and structures (bridges, tunnels etc.), and the continual repair and replacement of the worn components of existing infrastructure, such as the road surface, lights, and road markings.

Exhibit 3.1 Strategic Network of Highways in England



Source: Highways Agency, July 2006. URL: <http://www.highways.gov.uk/aboutus/139.aspx>

Following economic reforms instituted under the Government of Prime Minister Lady Margaret Thatcher, England embarked on a number of well publicized efforts to privatize major elements of the nation's transportation infrastructure assets. These included railroads, public transportation, and aviation. In addition, efforts were initiated to tap the financial resources of the private sector to help finance and deliver projects in a variety of sectors, including health care, accommodations, defense, and transportation. In 1990, the first design-build highway project contract was awarded in England.

England's plunge into public-private partnerships (PPPs) began in earnest in 1992 in the form of the Private Finance Initiative (PFI), which was intended to facilitate closer co-operation between the public and private sectors and introduce private sector skills and disciplines into the delivery and management of projects and services traditionally undertaken by the public sector. The Government's Highways Agency launched its PFI program in August 1994 with the announcement of eight motorway and trunk road projects to be delivered by private concessions, using design-build-finance-operations (DBFO) contracts financed by shadow tolls. The first of these DBFO project contract was awarded in England. In 2000 the first open book target cost contract was awarded, while in 2004 the first major Early Contractor Involvement (ECI) contract was awarded. In an ECI contract, the contractor becomes involved as early as the planning stage of the project, continuing through to construction completion and beyond if operations and maintenance are included in the contract scope. Compared to traditional delivery, the Highway Agency found that its total project delivery timeframe had dropped 45 percent from an average of 11 years to five years as a result of involving the private sector contractor earlier in the project development process.¹⁰

In the past twelve years, both public and private sectors in England have gained significant experience and confidence in using PPPs to fund and deliver infrastructure assets. According to Standard & Poor's, more than £48 billion in total capital has been invested in PPP projects in England to date with up to £64 billion in additional capital investment via PFI over the next sixteen years.¹¹

HIGHWAY PPP PROGRAM OVERVIEW

With limited public funding available for needed improvements to the nation's motorways, bridges, and tunnels UK's Highways Agency began to apply PFI on parts of the highway system in August 1994, using the design-build-finance-operate (DBFO) contracting and delivery approach. The Agency's objectives for each DBFO project were to:

- Ensure that the project road is designed, maintained and operated safely and satisfactorily so as to minimize any adverse impact on the environment and maximize benefits to road users;
- Transfer the appropriate level of risk to the private sector;

¹⁰ DeWitt, Steven D. *2004 International Construction Management Scan*. Summary presentation of results from the *2004 International Scan of Construction Management Practices for Effective Project Delivery, Contract Compliance and Quality Assurance*, sponsored by AASHTO, ARTBA, AGCA, and FHWA, through its International Technology Exchange Program, http://www.international.fhwa.dot.gov/construction_mgmt/index.htm.

¹¹ Jamieson, Craig, Adele Archer, Robert Robinson, and Robert Bain. *PPPs in the U.K. Maintain Momentum, Despite Some Bad Publicity*. Standard and Poor's Commentary, April 25, 2005. Reprinted in Standard & Poor's *Infrastructure & Public Finance Ratings – Public Private Partnerships, Global Credit Survey 2005*, May 2005, pp. 16.

- Promote innovation, not only in technical and operational matters, but also in financial and commercial arrangements;
- Foster the development of a private sector road-operating industry in the UK; and
- Minimize the financial contribution required from the public sector, particularly in the initial years of project development and delivery.¹²

DBFO contracts in England are typically for a period of 30 years from the commencement date, even though most financing used for these projects has a 20-year repayment period. This is done to encourage use of alternative funding sources, financial innovation, and the possibility of re-financing after the completion of construction to provide financial benefits to the Highways Agency. The Highways Agency also wanted a contract period that was sufficiently long to promote the use of life-cycle costing to the project.¹³

Since 1994, private concession teams have delivered or initiated numerous major highway projects under the PFI program for England's Highways Agency. These include such major infrastructure projects as the M6 Tollway, the Second Severn Crossing Toll Bridge, the Dartford Toll Bridge, and the M1-A1 Link shadow toll road. Most of the highway projects have been delivered through the DBFO contract arrangement using shadow tolls, whereby the concession team finances the project and is reimbursed for the cost of the project directly by the Government through vehicle-based payments, road availability payments, or active management (considering congestion and safety performance factors) payments over the term of the concession agreement. This eliminates the need to install tolling equipment and collect tolls directly from the users of the facility while encouraging the concession team to operate and preserve the highway at high performance standards to ensure the availability and use of the roadway. Few use actual tolls collected from users to fund the projects.

The involvement of the private sector through PPPs has enabled the Highways Agency in England to expedite the delivery of highway projects built to high standards at lower costs. It is estimated that for the first eight PPP highway projects delivered under the PFI program through DBFO contracts, the average savings was 15 percent when compared to the public sector costs.¹⁴ In addition, urban governments are outsourcing maintenance of their road networks to lower costs and improve performance, while speed cameras are widely used to produce additional program revenues.

Highway Projects Delivered or Proposed as PPPs

Over the past 12 years, numerous highway projects in England have been accomplished through the use of public-private partnerships involving a wide variety of contract and financing approaches. These are listed in Exhibit 3.1 on the following page by type of contract and financing approach used.

As noted in Exhibit 3.2, England uses shadow tolling to finance most highway projects involving PPPs. This is due to public opposition to direct user charging through tolls. For most improvement and expansion projects, including the construction of urban bypasses, shadow tolling continues to be used since the existing or parallel facilities are not tolled.

¹² Highways Agency, July 2006. URL: <http://www.highways.gov.uk/roads/3008.aspx>

¹³ Highways Agency, July 2006. URL: <http://www.highways.gov.uk/roads/2995.aspx> <http://www.highways.gov.uk/roads/2995.aspx>

¹⁴ Highways Agency, July 2006. URL: <http://www.highways.gov.uk/roads/2665.aspx>

Exhibit 3.2 Types of PPP Highway Project in England

PPP Projects Financed through Shadow Tolls

- Motorway A1 (M) - Shadow Toll DBFO
- Motorway M1–A1 Link - Shadow Toll DBOM
- Motorway A13 Upgrade – Shadow Toll DBFO
- Motorway A130 Bypass – Shadow Toll DBFO
- Motorway A19 Widen and Upgrade – Shadow Toll DBFO
- Motorway A30/A35 Lane Improvement – Shadow Toll DBFO
- Motorway A4048/A472 Upgrade – Shadow Toll DBFO
- Motorway A419/A417 Bypasses – Shadow Toll DBFO
- Motorway A50 Bypass – Shadow Toll DBFO
- Motorway A55 Extension – Shadow Toll DBFO
- Motorway A69 Bypass – Shadow Toll DBFO
- Motorway 40 Widening – Shadow Toll DBFO
- Isle of Sheppey Bridge – Shadow Toll DBFO

Other Types of PPP Projects, including Tolled Facilities and Maintenance Contracts

- M6 Bypass Tollway - DBFO
- Second Severn River Crossing Toll Bridge – DBFO
- Dartford River Crossing Toll Bridge – DBFO
- London Road Maintenance PPP
- National Roads Telecommunications Services PPP
- Downtown London Congestion Pricing Program - DBO
- Channel Tunnel – FBO (debt restructured in 2005)
- Skye Toll Bridge in Scotland - BOT/BTO (concession recently terminated by the Government due to public opposition to the high tolls imposed by the concessionaire)

Proposed PPP Projects

- Motorway A2 and A282 Widening – Shadow Toll DBFO
- Motorway A249 Upgrade – Shadow Toll DBFO
- Mercy River Crossing Toll Bridge - DBFO
- Thames Gateway Toll Bridge – DBFO
- Tyne River Crossing Toll Tunnel – BOT
- Motorway 25 Rehabilitation and Partial Widening (orbital highway around London metropolitan area) – Shadow Toll DBFO

Opposition to tolling appears to be subsiding somewhat as government agencies are forced to tap other sources of funding (such as private investment capital) to build much needed new capacity. As a result, several large new PPP projects have been financed on the basis of direct user tolls. This includes several large scale highway and bridge PPP projects. Several of these tolled projects and one of the prominent shadow toll financed projects are summarized at the end of this chapter.

Types of PPP Arrangements Used for Highway Projects

As reflected by the many PPP projects noted above, public agencies in England at both the national and local levels have developed significant experience in the development and management of public-private partnerships for surface transportation infrastructure, both in terms of development and maintenance. As a result a significant cottage industry of private sector providers of highway development, financing, operations, and maintenance services has developed using a variety of contracting approaches, including:

- Design-build-operate-maintain (DBOM)
- Design-build-finance-operate (DBFO)
- Design-build-operate-maintain-finance (DBOM-F) (same as DBFO in England)
- Build-operate-transfer (BOT)
- Build-transfer-operate (BTO)

Many of the concession arrangements in England extend for periods of 25-30 years.

PPP HIGHWAY PROJECT CASE STUDIES IN ENGLAND

The remaining pages of the chapter present case studies of four PPP highway projects sponsored by the Highways Agency, delivered by DBFO concession, and financed either by tolls or shadow tolls. These include the following projects:

- M6 Tollway
- Queen Elizabeth 2 Dartford Toll Bridge
- Second Severn Crossing Toll Bridge
- M1-A1 Link

The contents of each case study are organized into the following sections:

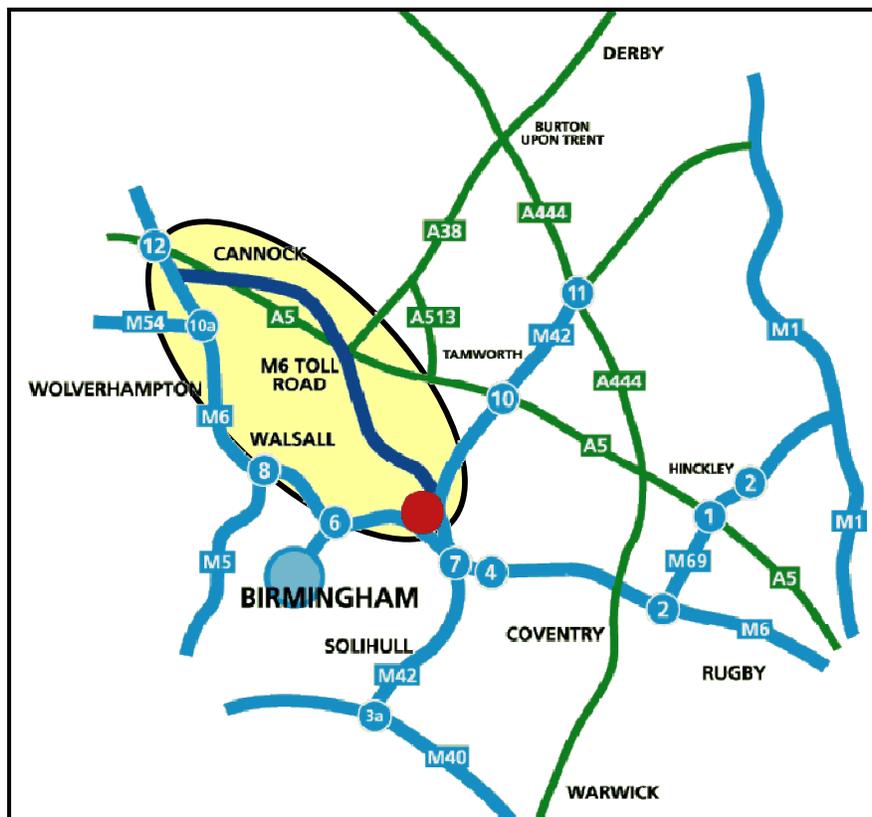
- Background
- Project description
- Partnership arrangement
- Issues and strategies
- Results
- Conclusions

M6 TOLLWAY

BACKGROUND

A relief road was needed as a by-pass and for through traffic to the north west of Birmingham, as an alternative to the highly congested M6 trunk road. Lacking the public funding to develop the roadway, the Government in 1991 decided the M6 Tollway would be a privately funded venture. This required a public-private partnership to expedite project financing and delivery through a design-build-operate-maintain-finance concession arrangement. Exhibit 3.3 provides a site map for the M6 Tollway.

Exhibit 3.3 M6 Tollway Site Map



Source: Coleshill Manor. URL: <http://www.coleshillmanor.info/location.php#>

PROJECT DESCRIPTION

The M6 Tollway (formerly known as Birmingham Northern Relief Road) is a 27 mile (44 KM) long six-lane divided motorway bypass in the West Midlands conurbation. The M6 Tollway connects at its northern end with the non-tolled M6 at a new junction north of Junction 11 near Cannock, Staffordshire. The route the M6 Toll follows is that of the existing road corridors of the A5, A38 and A446 passing through the counties of Staffordshire, West Midlands and

Warwickshire connecting at its southern end with the toll-free M6 just east of Junction 4 at Coleshill, Warwickshire. The M6 Tollway was built for \$1.7 billion (£900 million) and opened in 2003. Exhibit 3.4 shows the high quality of the toll road design and construction on a section near Carnforth.

Exhibit 3.4 M6 Tollway near Carnforth



Source: URL: http://en.wikipedia.org/wiki/Image:M6_motorway_near_Carnforth.jpg

For each journey on the M6 Tollway drivers pass through one toll plaza, either on the M6 Toll (a barrier toll plaza for each direction at opposite ends of the highway) or upon exiting at a junction (exit toll). Tolls vary by classification of vehicle, time of day, and which toll station(s) passed on the journey and can be paid by cash, credit cards, or electronic toll collection (ETC) transponder.

PARTNERSHIP ARRANGEMENT

This highway was Britain's first privately funded tolled motorway, following closely the initiation of the national government-supported Private Financing Initiative for infrastructure financing and development in 1992. A 53-year DBFO concession contract was originally awarded in 1992. However, local opposition and legal maneuvering delayed project initiation

until September 2000. The toll road opened to traffic in December 2003. The concession ends in 2054.

The partners to the PPP included:

- **Public Sponsor:** Highways Agency. Owen Williams Ltd. served as the Managing Agent for the Area Team responsible for the highway system in the West Midlands area, including this project.
- **Private Concession Team:** Midland Expressway Ltd (MEL) which consisted of the following two partners:
 - Macquarie Infrastructure Group (75%)
 - Autostrade (25%)

Supporting the concession team were the following firms, listed by function:

- **Technical Advisor:** Jacobs Babtie. Babtie is also fulfilling the roles of Technical Approval Authority, Certifying Engineer and Lenders' Technical Advisor.
- **Construction Joint-Venture** - CAMBBA Construction Group
 - Carillion
 - Alfred McAlpine
 - Balfour Beatty
 - Amec
- **Toll Operations** – Ascom Monétel
- **Financiers:**
 - Banque Indosuez (lead)
 - National Westminster
 - Barclays de Zoete Wedd
- **Private Advisors:**
 - Dresdner Kleinwort Benson
 - Ashurst Morris Crisp
 - Berwin Leighton

ISSUES AND STRATEGIES

- **Local Opposition to the Project.** Project delayed eight years due to longest ever public inquiry for a road project – due in large measure to the introduction of tolls and the determined opposition of nearby residents to the facility that would be paying the tolls. Most British citizens had become used to toll-free trunk since most new construction during the 1990s was financed by shadow tolls, whereby the Government reimbursed the project development team over time through what were essentially availability payments using general and transportation program funds without the users having any direct fees to pay to use the roadways.

Major objections by people living adjacent to the route (well organized Alliance Against the BNRR or AABNRR group)) caused serious delay by protracted legal procedures

including High Court Challenges. Certain opponents to the project went so far as to climbed trees, built tunnels, and occupied buildings in the planned right-of-way for the new tollway. They were removed by the police and tunnelling/climbing specialists.

To overcome this opposition, the PPP eventually negotiated an agreement with AABNRR to cease their challenges to the project based on certain conditions being met by the concessionaire. In keeping with the environmental sensitivity of the surrounding community, the M6 Tollway uses noise reducing asphalt that significantly reduces the environmental impact of the highway on adjacent neighborhoods and provides a more comfortable journey for patrons of the toll road.

- ***Cost Risks of Changing Standards during Highway Development Period.*** Given the long time period to begin highway design following signing of the concession agreement (eight years), there were a number of road design standards which were changed by the Highways Agency which impacted the cost of the project. In this case, since the changes were generated by the Highways Agency, the risks for changes in design standards were held by the project sponsor – the Highways Agency.

This was highly beneficial to the concession team, since the delays in the progress of the project were the result of public opposition not delays by the concession team which was ready to begin design as soon as the concession agreement was signed.

- ***Quality, Schedule, Cost, and Performance Risks during Concession Term.*** Under the terms of the agreement, the concession team bore the entire risks for the project except for design standard changes. This included planning, delivery, cost, quality, revenue, and even some statutory risks. Once the public opposition to the project was overcome, these risks were managed entirely by the concession team, led by Macquarie Infrastructure Group (MIG), which owns 100 percent of Midland Expressway Ltd, the concessionaire team for the M6 Tollway till 2054.

The successful management of these many risks can be attributed to the following features of the concession arrangement:

- The technical capability and experience of the concession team;
- The long-term commit of the concession team to the project;
- Delegating technical quality approval authority to the concession team, which allowed for timely structural inspections and approvals and enabled the design-build program to proceed on schedule;
- An integrated contract that included delivery of the tolling systems under the main DBFO contract; and
- The strong positive partnering relationship that was established and maintained throughout the project between the concession team and the project sponsor, the Highways Agency.

RESULTS

The project has been open for two and a half years with the first two annual monitoring reports issued. Car volumes are more or less as expected, but truck volumes are much lower than forecast.

In late May of this year, the Government granted MIG, as the sole owner of the M6 Tollway concession, permission to refinance the project by restructuring its \$1.1 billion in debt so that the debt service on the project better matches the cash flow expected from the project over the 54 years of the concession. This will enable MIG to take out early profits from its investment in the project. The refinancing is expected to provide MIG with significant gains, amounting to about \$700 million. Unlike most other PPP projects sponsored by the Government, MIG it is not required to share the gains derived from refinancing with the project's public sponsor, Highways Agency. This is because the concession team led by Macquarie assumed all of the risks for this project as a toll road, versus a shadow toll road.

Demonstrating its long-term commitment to the area, MIG has agreed to reinvest 30 percent of its refinancing gains to fund several neighboring public projects of great interest to the Highways Agency. These include a toll-free extension of M54 to the M6 Tollway plus expansion of an interchange at the southern end of the M6 Tollway. Both projects will improve accessibility to the facility. This represents a win-win solution for both public sponsor and private provider in the PPP, whereby the Highways Agency gets several priority projects built without cost to the public, while MIG receives the benefits of increased traffic volumes and toll revenues on its toll road as a result of the improved accessibility to other portions of the region's highway network, 70 percent of the proceeds from the debt restructuring, and a more positive public image for its contribution to the area's highway infrastructure. MIG also agreed to operate these additional facilities during the concession period.

CONCLUSIONS

As the first toll road in England to charge motorists a direct charge for using the highway, M6 Toll represents a bold move to use alternative financing arrangements to the traditional shadow tolling approach to augment funding resources for highway development and minimize the project risk to the sponsoring Highways Agency.

While traffic continues to gradually grow and truck traffic continues to lag expectations, there was discussion about extending the M6 Tollway 50 miles north towards Manchester for a total cost of \$6.5 billion (£3.5 billion). However, several factors caused the proposal to be abandoned in late July 2006, including:

- High cost of right-of-way needed for the project;
- Significant local opposition to tolling along the proposed corridor; and
- Lack of private partner interest in the project given the early performance of the existing M6 Tollway and the perceived risks of advancing such an expensive project in the face of local opposition.

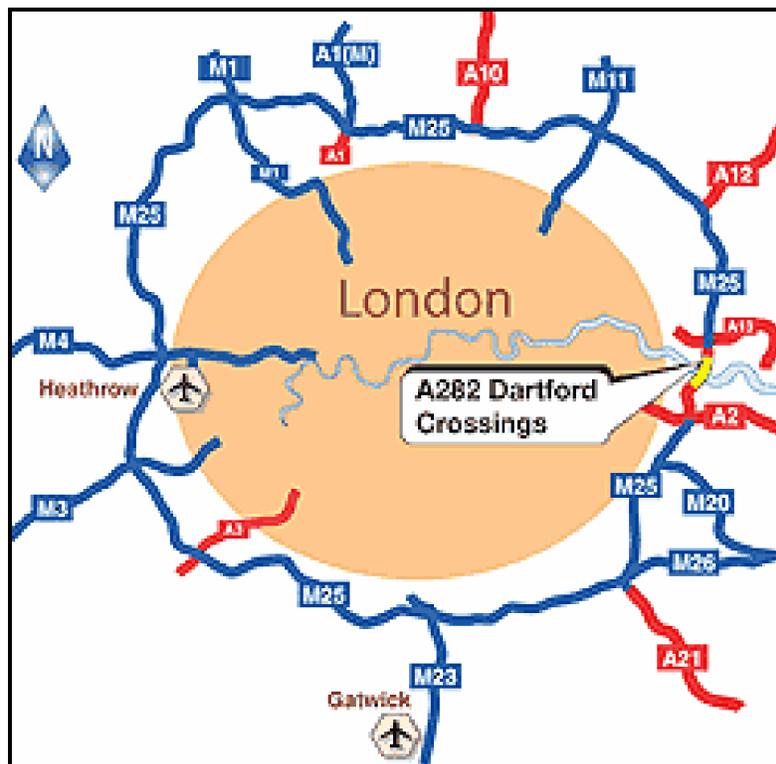
Without a private concession team willing to tackle the project, the Government has elected to increase the capacity of the existing M6 expressway from 6 lanes to eight lanes, thereby reducing significantly the cost and land needed for the project. The main drawback of returning to the traditional approach to highway development is that the new capacity will not be available until 2017 at the earliest, assuming the Treasury has the funds to widen the road which is not assured.

QE2 DARTFORD BRIDGE

BACKGROUND

When the M25 orbital motorway around London was completed in 1986, the two Dartford tunnels provided a vital link in the national road network. Traffic on the roadway soon exceeded the maximum designed capacity of 65,000 vehicles per day on average, and forecasts predicted annual throughput in excess of 40 million vehicles. A new toll bridge at Dartford was therefore required to provide needed additional capacity along the M25 motorway to the two existing tolled tunnels, one of which opened in 1963 and the second in 1980. Exhibit 3.5 below presents a site map of the location of the bridge relative to the surrounding highway network.

Exhibit 3.5 QE2 Dartford Bridge Site Map



Source: Highways Agency, 2006.

URL: <http://www.highways.gov.uk/roads/projects/4066.aspx>

In March 1986, the Government published guidelines inviting the submission of private sector bids for the design, construction, and operation of a third crossing of the River Thames between Thurrock and Dartford. The expansion of the existing twin tunnel crossing of the River Thames at Dartford represented the first fully privatized highway infrastructure project to be constructed in England in the twentieth century, based on a 20-year design-build-finance-operate PPP contract.

PROJECT DESCRIPTION

The QE2 Dartford Bridge was the first new crossing of the River Thames in 50 years when it was officially opened to traffic in 1991 by Queen Elizabeth. The \$160 million (£86 million) project called for a double cable-stayed concrete bridge totalling one-half mile (812 meters) for the main span and two back spans, plus and a 0.6 mile (1 km) approach viaduct on each bank, which link the high level roadway over the river directly to the road network on the north side and the toll collection plaza and the road system on the south side. The total project provides a 1.73 mile (2.81 km) long four-lane bridge facility that rises 211 feet (65 meters) above the river at its highest point and has a center span of 1,463 feet (450 meters), making it one of the longest concrete cable-spayed bridges in the world and the longest in Europe.

The bridge carries southbound M25 traffic over the River Thames while the older two tunnels, each with two lanes and 0.55 miles (0.9 km) in length, carry northbound M25 traffic under the River Thames in the same vicinity near Dartford. The Dartford Crossing Bridge and two tunnels are all tolled facilities. The bridge has a capacity of 70,000 vehicles per day while the two tunnels have a combined capacity of 65,000 per day. Actual daily traffic volume is 85,000 vehicles, although this rises to 100,000 in peak periods. The Dartford Crossing facilities has 12 toll booths in each direction, charging \$1.85 (£1.00) for cars, \$3.34 (£1.80) for light vans, and \$6.69 - \$10.77 (£3.60 - £5.80) for trucks of increasing size. A seven percent discount is provided to users of the facilities' electronic toll collection system called DART-Tag.

Exhibit 3.6 portrays the completed QE2 Dartford Bridge and approach viaducts carrying M25 over the River Thames.

Exhibit 3.6 QE2 Dartford Bridge



Source: Gillard-Reid, July 2006

PARTNERSHIP ARRANGEMENT

The Dartford Crossing Bridge was the first Thames River crossing at an entirely new location in more than 50 years. It was the first time in the last century that the Government had fully involved the private sector in financing, as well as designing, building and managing, a major public infrastructure project within England. The private sector became involved in this first DBFO project in the mid 1980's when the Government introduced new guidelines to encourage promoters to invest private sector finance in the development of public sector infrastructure projects.

Eight competing consortia responded to the Government's invitation. The successful bidder was Trafalgar House Public Ltd. Company, which was granted the 20-year concession in September 1986. In 1988, legislation called the Dartford-Thurrock Crossing Act allowed transfer of the crossing to Dartford River Crossing Ltd., established by Trafalgar House Public Ltd, to allow construction of the bridge to start almost immediately due to the ability of the private consortium to promptly arrange financing for the project. The total cost of the project amounted to \$230 million (£124 million), with \$160 million (£186 million) for the bridge and \$70 million (£138 million) for the two existing tunnels at the crossing.

The partners to the PPP included:

- **Public Sponsor:** Highways Agency. Kvaerner Construction Ltd. served as the Managing Agent for the Government. Kvaerner Construction Ltd. was subsequently bought by Macquarie in 1999).
- **Private Concession Team:** Dartford River Crossing Ltd., which consisted of the following four firms:
 - Macquarie Infrastructure Group
 - Prudential Assurance Company
 - Kleinwort Benson
 - Bank of America

Supporting the concession team were the following firms, listed by function:

- **Principal Engineering Contractor** - Cementation Cleveland Dartford Consortium, a joint venture between:
 - Kvaerner Construction Ltd.
 - Kvaerner Cleveland Bridge Ltd.
- **Management Contractor** – Kvaerner Construction Ltd., subsequently bought by Macquarie in 1999.
- **Bridge Design Firms:**
 - Dr-Ing Hellmut Homberg and Partner designed the cable stayed bridge superstructure
 - Kvaerner Technology Ltd. designed the bridge substructure.
- **Financiers:**
 - Bank of America International Syndicate - \$178 million senior loan
 - Cazenove & Company - \$113 million subordinate loan/stock

- **Financial Advisors:**
 - Kleinwort Benson
 - Cazenove & Company
 - Ashurst Morris Crisp

Under the terms of its agreement with the Government, the operating company (initially Dartford River Crossing Ltd.) collects tolls as a means of recovering the costs of constructing the bridge and the costs of operating the crossing, including the two tunnels. Toll charges are controlled by the Government so they do not exceed the rate of inflation. It is estimated that all costs associated with constructing and financing the bridge and rehabilitating the two tunnels will be recovered from tolls within 20 years of the start of the concession period and that all three Dartford crossings (bridge and two tunnels) will be handed back to the Government, debt-free.

In 2003, the original concession ended and Le Crossing (composed of Babtie, Ringway, and Cofiroute) won a competitive tender to take over the operations of the facilities from Dartford River Crossing Ltd., under the terms of Dartford-Thurrock Crossing Act. Le Crossing's new contract is for a period of between 3 ½ - 5 ½ years, depending upon the results of performance reviews.

ISSUES AND STRATEGIES

The risks to the PPP in financing and developing the QE2 Dartford Crossing Bridge were largely mitigated due to the following project-specific features:

- **Competitive Position of Parallel Bridge.** The project benefited from being located at a strategic choke point along a major urban highway surrounding London which was already highly congested and faced significant growth in traffic. As a bridge, tolling users of the facility was more accepted than if this were a toll highway. It took nine more years after the QE2 Dartford Bridge opened before the public accepted the first tolled highway in England, the M6 Tollway.
- **Traffic and Revenue Risk to Concession Teams.** The consortiums responsible for financing, developing, and operating the bridge were reasonably confident of the cash flow likely to be generated by tolls due to the long history of traffic and revenue data on the tunnels carrying the M25 orbital road under the River Thames and projections of future traffic volumes in this major trunk highway surrounding London.
- **Capabilities of Development Team.** The initial private consortium, Dartford River Crossing Ltd., was composed of a broad array of reputable firms with sufficient expertise and depth of resources to complete the project development within budget and schedule.
- **Financial Risk to Government Sponsor.** As a DBFO project, the bridge project posed little risk to the sponsoring government agency despite the many technical challenges and obstacles that had to be faced along the way such as coordinating the work around changing water levels and the river traffic of a busy tidal waterway.
- **Use of Electronic Toll Collection.** To handle the high volume of traffic using the Dartford Crossing facilities each day, the operating company installed an electronic toll collection system known as DART-Tag, a pre-paid account that provides users with a seven percent discount. The DART-Tag itself is a microwave transponder tag that is

provided at no cost to the user. It classifies each vehicle when it enters the toll plaza and allows passage if there are sufficient funds in the subscriber's DART-Tag debit account.

Drivers are alerted to the status of their DART-Tag accounts by a colored lighting system at the toll plazas, where green means adequate fund reserves, amber means ten or less credits remaining, and red means no funds remaining. A red light means the driver must use cash to pay the crossing tolls until refurbishing the account. DART-Tag users represent 20 percent of the vehicles using the Dartford Crossing facilities. Automatic coin machines and manual cash collection are also available for those who do not use DART-Tag or have no funds in their accounts.

Exhibit 3.7 shows the toll plazas for the QE2 Dartford Bridge for southbound traffic and for the two tunnels carrying northbound traffic along the M25 orbital road.

Exhibit 3.7 Toll Service Plazas for QE2 Dartford Bridge (on right) and Tunnels (on left)



Source: URL: <http://www.highways.gov.uk/roads/projects/4069.aspx>

RESULTS

The QE2 Dartford Bridge was delivered on time and within budget by the original DBFO consortium. Over 836 million vehicles have used the Dartford Crossing (including both tunnels and bridge) from 1963 to 2001. A total of 85,000 vehicles use the Dartford Crossing facilities each day. The bridge is paying back its debt at a faster rate due to higher than forecast traffic flows on the M25 orbital road at Dartford Crossing.

CONCLUSIONS

This project was the first major PPP highway-related project in England to rely entirely on the private sector for financing, delivering, and operating facility, with direct tolls used to repay the debt service. The resulting project provides congestion relief along this portion of M25 for the public sponsor by expediting the financing and construction of the bridge, which effectively doubled the capacity of this important crossing of the River Thames. It also provided a reasonable return to the private partners to the PPP arrangement and the potential to retire all debt associated with the bridge construction and tunnel rehabilitation within 20 years of the bridge opening. This represents a win-win situation for both the public and private partners to the PPP arrangement. Even though this was the first DBFO highway project undertaken in England, it is widely regarded as a successful PPP project.

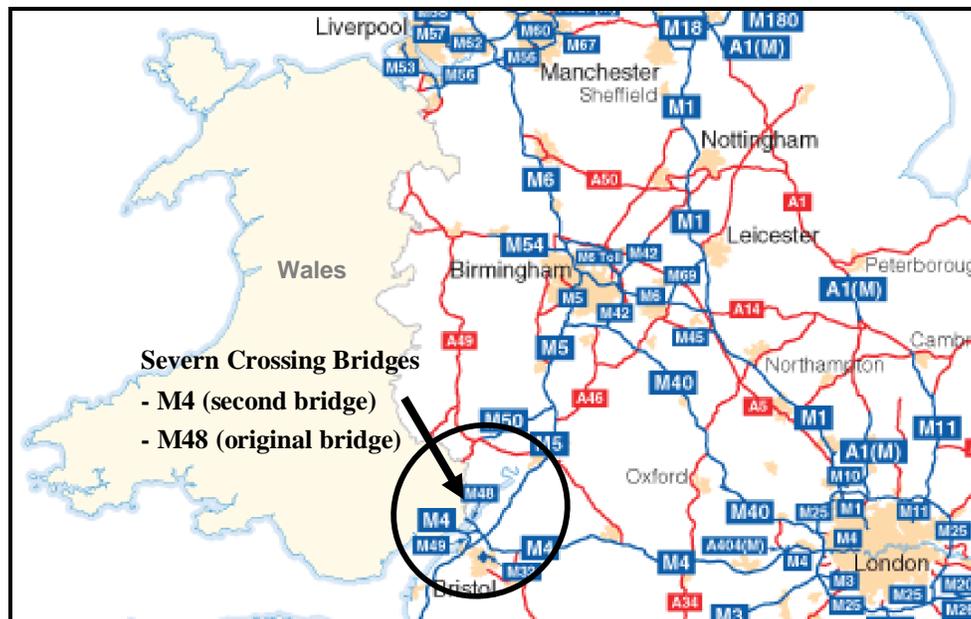
SECOND SEVERN CROSSING BRIDGE

BACKGROUND

The Severn River and estuary form a natural geographic barrier between England and Wales. In 1966, the first Severn Crossing Bridge was opened to traffic, extending the M4 radial highway into the M25 orbital highway around London by way of the M48 extension of M4 into Wales. By the mid 1980s, traffic along the M48 highway had grown to the point where a second Severn Crossing Bridge was needed to relieve congestion. Preliminary planning for the second crossing bridge began in 1984 with a decision reached in 1986 to investigate the best location for the new bridge, and the layout of the new approach roads that would be needed to connect the bridge over the Severn River and its estuary to the M4 highway.

The Severn River and Estuary Crossing is the closest access point between southern Wales and London via the M4 highway, as shown in Exhibit 3.8.

Exhibit 3.8 Severn Crossing Bridge Site Map



Source: U.K. Highways Agency. URL: <http://www.highways.gov.uk/aboutus/139.aspx>

PROJECT DESCRIPTION

The Second Severn Crossing provides essential additional traffic capacity across the Severn River and estuary between England and Wales approximately 3 miles (5 km) down river of the original bridge. The Second Severn Crossing Bridge cost \$613 million (£330 million) to construct between 1992 and 1996. It is a cable-stayed steel girder and truss bridge with a center span of 1,482 feet (456 meters), a total bridge length of 3,081 feet (948 meters), and a height of 120 feet (37 meters) above the river, as shown in Exhibit 3.9. The first Severn Crossing Bridge was built in 1966 as a standard suspension bridge, as shown in Exhibit 3.10 on the next page.

Exhibit 3.9 Second Severn Crossing Cable-Stayed Bridge



Source: URL: http://en.wikipedia.org/wiki/Image:New_severn_bridge_best_750pix.jpg

Exhibit 3.10 Original Severn Crossing Suspension Bridge



Source: URL: <http://en.wikipedia.org/wiki/Image:SevernBridgeLookingNorth.JPG>

There are also two viaducts on either side of the cable-stayed suspension bridge of about 1.3 miles (about 2,100 meters) each. The total length of the Second Severn Crossing Bridge and its two approach viaducts at 3.2 miles (5.1 km), carrying six lanes of traffic over the Severn River.

When combined, the two bridges over the Severn River carry 66,000 vehicles over the Severn River each day, amounting to over 12 million vehicles on an annual basis. Unlike the original Severn Crossing Bridge, there are no pedestrian/cycle paths on the Second Severn Crossing Bridge. Exhibit 3.11 shows in detail the location of the two Severn Crossing bridges.

Exhibit 3.11 Detailed Map with Both Severn Crossing Bridges



Source: URL :

<http://www.streetmap.co.uk/newmap.srf?x=352000&y=186000&z=5&sv=352000,186000&st=OSGrid&u=N&tl=M4%20Second%20Severn%20Crossing&ar=y&bi=~&map=newmap.srf&searchp=newsearch.srf>

PARTNERSHIP ARRANGEMENT

Lacking adequate internal funding to build and operate the bridge, the Government decided to enter into a PPP arrangement to provide private funding and expedite the completion of the project to ease the congestion in this vital corridor. This was the second major estuary crossing to be designed, built, financed and operated through the private sector, the first being the QE2 Dartford Bridge as described earlier.

For this project, the Government used a design-build- finance-operate (DBFO) PPP concession as the contract vehicle to deliver the bridge. Under this arrangement, the concessionaire retains ownership of the bridge (much like a build-operate-transfer or BOT contract) until such time as the concession ends and the bridges are turned over to the Highways Agency.

In 1989 four concession teams proposed on the project. The Government awarded the DBFO PPP contract to the successful concession team described below in October 1990. However, it took two more years for the Parliament to pass the necessary legislation called the "Severn Bridges Act 1992" set the starting date of the concession for late April 1992.

The members of the resulting PPP included the following:

- **Public Sponsor:** National Road Authority (Highways Agency), which funded the approach roads to the Severn Crossing. Maunsell & Partners served as the Government's Managing Agent for the concession project.
- **Private Concessionaire Team:** Severn River Crossing PLC, is a joint venture team in which each member holds a 50 percent interest in the project:
 - John Laing Ltd.
 - GTM Entrepouse (a division of VINCI Concessions)

The JV designed, built, and financed the Severn River and Estuary Crossing Bridge project, and took over the operation and maintenance of the original Severn Crossing Bridge. The concessionaire performs both regular maintenance and makes any repairs needed to keep the facilities operating efficiently.

Supporting the concession team were the following firms, listed by function:

- **Architect:** Percy Thomas Partnership
- **Structural Design:**
 - Halcrow & Partners Ltd.
 - SEEE
 - Gifford & Partners for design review
- **Construction:**
 - VINCI Concessions
 - Cimolai Costruzioni Metalliche (steel construction)
 - Freyssinet Ltd. (stay cables, post tensioning, and component lifting)
- **Financiers:**
 - Bank of America
 - Barclays de Zoete Wedd

The financing arranged by the Severn River Crossing PLC through Bank of America and Barclays de Zoete Wedd covers the following costs:

- Designing and constructing the Second Severn Crossing Bridge;
- Paying the outstanding debt on the present original bridge; and
- Operating and maintaining the two bridges for the 30-year term of the concession.

By enabling statute and contract, the concession period is set at a maximum of 30 years. The actual end date of the concession will occur when Severn River Crossing PLC has collected a fixed sum of money from tolls valued in 1989 terms. Toll levels were set for three categories of vehicles by the promoters Laing-GTM at the time of the contract bid. The toll levels set in 1989 terms were written into the concession contract and are embodied in the Severn Bridges Act 1992. Toll levels are amended each year to account for inflation based upon the increase in the Retail Price Index since 1989. To meet its financial obligations, the concessionaire's only sources of income are the toll revenues from the two bridges. To meet its financial obligations, the concessionaire's only sources of income are the toll revenues from the two bridges.

The two bridges are tolled in the westerly direction only, with the tolls used to pay for the development, operations, and maintenance of the two facilities. There are 13 toll booths on the new bridge and eight toll booths on the original bridge. Current tolls for both bridges are as follows:

- \$9.1 (£4.9) for vehicles with up to nine seats;
- \$18.2 (£9.8) for small buses with up to 17 seats and vans; and
- \$27.3 (£14.7) for large buses and trucks.

Motorcycles and disabled badge holders are exempt from the tolls on both bridges. There is no added charge for trailers or caravans towed behind the primary vehicle. Other users pay by cash, check, or via an electronic tolling system called Severn TAG.

The Severn TAG program enables bridge patrons to purchase an electronic transponder for a refundable \$56 (£30) that permits users to access the bridges without stopping to pay the toll by cash or check. Two versions are offered. The first is called a Season TAG which enables patrons to use the bridges on an unlimited basis if they pay a fixed fee, either on a monthly or quarterly basis, for a modest discount. Severn TAG users can also pay funds into an account that approximates the number of trips they expect to make during the next month. This permits users with adequate balances in their accounts to pass through the toll plazas without stopping, or in certain Priority Green lanes dedicated solely to those with Severn TAGs at close to highway speeds. Users of these Fleet/Trip TAGs are responsible for refurbishing their accounts before they run out. The system automatically debits the proper amount by vehicle classification and toll amount, even when the tolls change.

From February 2005, all privately run toll roads and bridges in England became subject to a 17.5 percent value-added tax. In return, the Government has pledged that toll charges on the two bridges will not increase. The two Severn Crossing Bridges are the only major crossings to be affected in this way, because they are both privately run.

ISSUES AND STRATEGIES

The major issues confronting the sponsors and concessionaire for this large bridge project and the strategies used to address them included the following:

- ***Financing the Various Components of the Estuary and River Crossing.*** The total cost of the project amounted to \$1.08 billion (£581 million), including building the second bridge, paying off the outstanding debt on the original bridge, and operating and maintaining both bridges over the term of the concession agreement. In 1988, the Government concluded it lacked sufficient funding to pay for both the estuary and river crossing bridge and the estuary approach roads. Therefore it decided in 1988 turn to a private concession team to finance the estuary and river crossing bridge, with the Government paying for the estuary approach roads.

With the project divided between a publicly-funded approach roads portion and a privately-funded main estuary and river crossing and toll plaza, the Government had flexibility regarding how to deliver each portion of the project. The approach roads portion funded by the Government was contracted as a design-build project. The estuary and river crossing and toll plaza project (the Second Severn Crossing Bridge) was contracted as a DBFO project to a private sector concession team.

The resulting financial arrangement for the DBFO contract included the following components:

- Bank loan – \$353 million (£190 million)
- BEI loan – \$ 279 million (£150 million)
- Indexed bond loan – \$243 million (£131 million)
- Government bond loan – \$111 million (£60 million)
- Concession equity – \$93 million (£50 million)

The bank debt was refinanced in 1997 and again in 2002 to lower the debt service costs for the project.

- ***Environmental Risks.*** With the proposed Second Severn Crossing Bridge proposed to cross both a wide estuary and the Severn River, significant environmental concerns needed to be addressed early in the planning stages of the project to prevent long delays in the project due to environmental protests and lawsuits. The Government had detailed environmental and preliminary design studies preformed in 1987 to identify environmental issues and develop a proactive strategy to avoid or mitigate them. This included the provision of Ltd. construction access routes, separate drainage networks and outfalls, extensive landscape planting, and noise fencing along portions of the approach roads to the new bridge.
- ***Public Opposition.*** Public opposition to the project posed another challenge to the ability of the Government to attract private-sector interest in committing to a PPP whereby its only source of reimbursement would be the tolls from the new bridge, as well as the existing bridge. Other projects like the M6 Tollway had experienced long delays due to public opposition.

To address this potential threat, extensive public outreach and stakeholder communication efforts were undertaken by the Government between 1987 and 1990, whose results impacted the location of the estuary crossing and the approach roads to the new bridge. In addition, a high embankment and wetland area was provided beyond the embankment to screen the new toll plaza on the Welsh side of the bridge from residents of a nearby community, while complementary landscaping provided visual screening of the toll plaza and approach roads on both sides of the Severn River and estuary.

- **Local Community Impacts.** The construction of the Second Severn Crossing Bridge posed significant traffic, noise, and air quality impacts on the neighboring communities along the approach road corridors to the site of the new bridge. To alleviate these potential local impacts during the construction period, by-pass construction roads were created to enable trucks to deliver materials to the site without passing through the local communities on both sides of the Severn River and estuary. In addition, the partners to the PPP held regular liaison meetings with local officials and representatives of local community groups to keep them informed of construction progress and address any issues raised by these local representatives.
- **Structural Obsolescence of Older Bridge.** A potential traffic, revenue, and cost risk to the private team responsible for operating and maintaining both Severn Crossing bridges under the current concession contract has recently been discovered as a result of the inspection of the 40-year old cables on the original suspension bridge. This more in-depth inspection was prompted by a finding of severe deterioration of suspension cables on another bridge built at approximately the same time, the Forth Road Bridge. Pending further technical review, this may require weight restrictions on the original bridge until the cables are restored. This poses a traffic and revenue risk to the PPP concession team, which may delay retirement of the debt service on the two bridges and add to the costs to be borne by the concession team now responsible for the two bridges.

This situation highlights a major risk for PPP concession teams in taking over existing and mature transportation infrastructure facilities, which need to be addressed in the concession contract. These contracts need to define the limits or conditions under which the new concessionaire would be legally and financially responsible for the reconstruction or replacement of major infrastructure features which may wear out prematurely due to any one of the following situations

- Poor design or construction when the facility was first built;
- Higher-than-expected traffic volumes, especially by heavy trucks; or
- Adverse weather conditions.

It would appear unlikely that the concession team of Laing-GTM would be responsible for the rehabilitation of the subject suspension cables since it was not involved with the design or construction of the original bridge or its operation and maintenance for the first thirty years after the bridge opened in 1966. Severn River Crossing PLC has only been responsible for operations and maintenance of the original bridge since 1996, which would not appear to include reconstruction or replacement of major bridge components due to fatigue.

RESULTS

The construction of the Second Severn Crossing Bridge provides necessary added capacity to serve the M4 highway. 66,000 vehicles use the two crossing bridges each day. Tolls were collected from over 20 million vehicles crossing the two Severn River bridges last year (2005). This additional capacity is especially critical now that the original Severn Crossing Bridge appears to need major rehabilitation work on its aging suspension cables. Due to the high volume of traffic using both of these crossings, it is vital that caring for their upkeep is assigned the utmost importance.

CONCLUSIONS

As one of the first and largest PPP projects in England, special efforts were made by all parties to the partnership to ensure that the project would proactively identify and address major technical, environmental, and local issues. With the due diligence performed by the sponsoring agency and supporting consultants prior to the approval of the Second Severn Crossing Bridge location and design and also during construction, there was minimal public opposition to the development of the Second Severn Crossing Bridge. By having the public agency take responsibility for the approach roads and the private concession team take responsibility for the Severn River and estuary, this created a true public-private partnership involving both groups whose complementary objectives were the completion of a second access to the aging original Severn River Bridge and leveraging of scarce public resources to get the project opened in a timely manner.

The PPP between Highways Agency and Severn River Crossing PLC enabled the second bridge to be delivered on time and budget by the DBFO joint venture, who arranged to finance the project, retire the debt on the parallel original bridge, and perform operations and maintenance on the combined facilities over the term of the contract, which ends when the debt service is retired by the tolls collected on the two bridges up to a maximum of 30 years. By assuming responsibility for both facilities, Severn River Crossing PLC is in a better position to manage traffic in this vital corridor between England and Wales, and to better coordinate maintenance efforts requiring diversion of traffic from one bridge to the other when conditions require closing one of the two bridges.

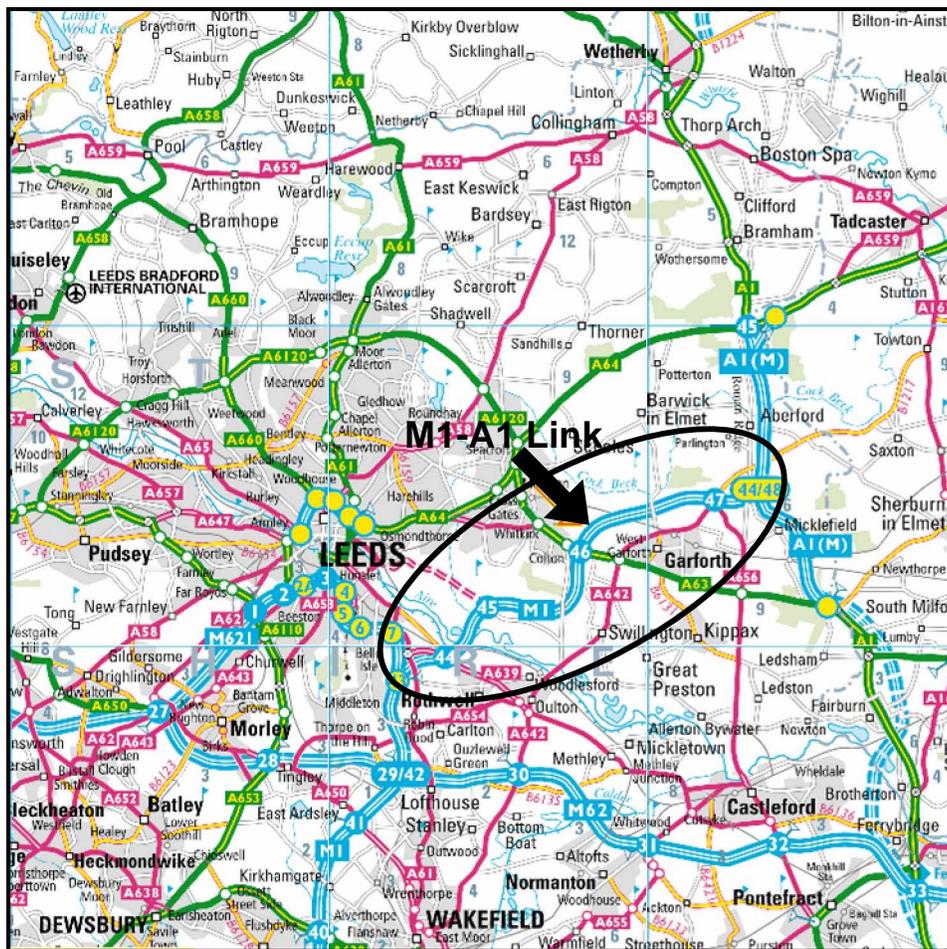
M1-A1 LINK

BACKGROUND

The M1-A1 Link, also called the Yorkshire Link, was one of four major highway projects in the initial program put out by the Government for DBFO implementation in the 1990s. The highway provides a critical connection between the M1 highway just south of the City of Leeds to the parallel A1 highway south of Wetherby, as shown by the site map in Exhibit 3.12 below.

Although not directly charging tolls to users, this is one of many shadow toll projects enabling the Highways Agency to expedite delivery of a needed project by enabling the private sector concession team to finance, design, build, and maintain the project for a period of time, while the Government reimburses the concession team based on the volume of traffic using the road and the condition/performance of the road.

Exhibit 3.12 M1-A1 Link Site Map



Source: URL:

[http://www.streetmap.co.uk/newmap.srf?x=435000&y=435000&z=5&sv=435000,435000&st=OSGrid&u=N&tl=M1%20extension%20to%20A1\(M\)&ar=y&bi=-&mapp=newmap.srf&searchp=newsearch.srf](http://www.streetmap.co.uk/newmap.srf?x=435000&y=435000&z=5&sv=435000,435000&st=OSGrid&u=N&tl=M1%20extension%20to%20A1(M)&ar=y&bi=-&mapp=newmap.srf&searchp=newsearch.srf)

PROJECT DESCRIPTION

The M1-A1 Link (also known as the Yorkshire Link and the Belle Isle to Bramham Crossroads Section and Connecting Roads), provides highway connection between two major north-south roadways around Leeds in the north of England. Constructed between 1996 and 1999, the highway links the M1 motorway south of Leeds and A1 trunk road south of Wetherby and serves as a southern by-pass of through traffic around the Leeds conurbation. It functions as a part of the national highway network and serves both national and regional traffic, as well as economic development to the east of Leeds.

The M1-A1 Link is a 19 mile (30 km) route that consists of a 6 lane highway, one viaduct, two tunnels, 37 bridges, and 18 masts supporting closed circuit television cameras (CCTV) to monitor traffic conditions and identify the location of incidents along the roadway. This is the largest shadow toll road projects in terms of the contract cost of \$544 million (£293) and included upgrades to portions of the M1, A1, and M62 highways in the vicinity of the new link. Construction of the M1-A1 Link began in March 1996, shortly after contract signing, and opened to traffic three years later in February 1999. The private concession team designed, built, and financed the project and continues to operate and maintain the facility under a 30-year DBFO contract with the Highways Agency.

Exhibit 3.13 shows an important component of the M1-A1 Link, the Aired Valley Viaduct, while it was under construction.

Exhibit 3.13 Aire Valley Viaduct under Construction



Source: CBRD (Chris's British Road Directory), July 2006 URL: <http://www.cbrd.co.uk/histories/m1-a1/>

PARTNERSHIP ARRANGEMENT

To expedite this project, the Government elected to secure a PPP contract with a consortium team able to design, build, finance, and operate the facility. During the initial procurement process, the winning team of Trafalgar House and Wimpey was converted to Kvaerner and BIBB when the firm that acquired Wimpey's civil engineering interests refused to sign the concession agreement. Wimpey was then replaced by Balfour Beatty (a part of BICC). As a result, the Highways Agency entered into a 30-year DBFO concession contract with the concession team of Kvaerner and BICC. The resulting contract extended from 1996 to 2026.

The composition of the resulting PPP is listed below:

- **Public Sponsor:** Highways Agency. Pell Frischmann Consultants Ltd. performed the preliminary design and engineering services for the project before the concession procurement process, and subsequently serving as the Management Agent on behalf of the Government.
- **Private Concession Team:** M1-A1 Link Ltd. won the original concession, consisting of a joint venture between BICC and Kvaerner Construction. Through acquisitions, this DBFO concession company became Connect M1-A1 Holdings Ltd. which is a joint venture team in which each member holds a 50 percent interest in the project:
 - Balfour Beatty (construction division of BICC) – primarily responsible for the construction, operation, and maintenance of the highway link
 - Kvaerner Construction Group (whose interest in the project was subsequently acquired by the Macquarie Infrastructure Group (MIG) in 1999) - primarily responsible for construction of the highway link. Since its acquisition of Kvaerner's interest in the project, MIG has been primarily involved in overall project management and financial management functions relating to the M1-A1 Link.

Supporting the concession team was the Jacobs Baktie Group, which provided design and construction engineering services throughout the concession team's project development process.

ISSUES AND STRATEGIES

- **Local Community Concerns.** Environmental and local concerns regarding the project were apparent when preliminary planning began in the late 1960s and extended into the 1980s. After a year-long public inquiry into the project during 1982, it was decided not to proceed with the project but upgrade other major roads in the vicinity of the project. Patience paid off in 1993 when following eight years of further study and public consultation that relocated the route of the link to a more acceptable location, the Government announced its decision to proceed with the project as a DBFO PPP.

The DBFO contract was awarded in 1996 as a shadow toll-financed PPP. By waiting for the environmental, routing, and public concerns to be fully heard and addressed, the Government was able to quickly proceed with the project through the DBFO contracting process. This avoided significant cost and schedule risks to the concession team by not beginning the procurement process until these issues were resolved through an on-going process of planning, consultation, refinement, and resolution.

- ***Environmental Concerns.*** Recognizing the environmental sensitivity of the area through which the M1-A1 Link would pass, the concession team sought to integrate the new road into the existing landscape and incorporate environment and landscaping mitigation measures as well as a range of environment benefits and enhancements into the overall design plan. It turned out that this project passed through an Area of Specific Scientific Interest (ASSI) due to the presence of a rare thistle, the broomrape (*Orobanche Reticulata*), which flourishes within the bank of exposed magnesium limestone that runs north-south through the alignment of the M1-A1 Link.

Instead of stopping the project, it was discovered that the proposed embankments for the highway would provide ideal habitat conditions for the rare thistle. As a result this area has become one of the top two sites for this species in Britain, as confirmed by annual inspections by the environmental watchdog group, English Nature which has found the plant present in four of the five designated areas.

- ***Public Opposition to Direct User Charges for Road Use.*** While the Government was moving ahead with its PPP agenda to expand the transportation infrastructure across England, promote competition, and improve service to users in the 1990s, public opposition to direct user fees (direct tolling) served as a major impediment to securing private sector interest by concession teams. To reconcile the dilemma, the Government elected to reimburse the private sector concessionaires directly over the term of the contract by using shadow tolls that were based on the volume of traffic using the highways built in this way. This avoided direct tolling of users, the user inconvenience of stopping to pay toll, and the cost of building, maintaining, and operating tolling facilities

On its part, the concession team financed the project through a combination of equity from the two members of the joint venture, augmented by loans (debt) obtained from a combination of 32 banks. This spread the financial risk among a wide group of stakeholders, with the joint venture demonstrating its commitment to the project through its contribution of equity at the beginning of the contract.

The use of the shadow tolling approach encouraged the concession team to promptly deliver the project to begin the cash flow from the Government. The scheme also encouraged the concession team to operate and maintain the facility to maximize its appeal to prospective users, to minimize the need for unscheduled maintenance and rehabilitation, and to promptly clear incidents along the road way to minimize the removal of lanes from service that could reduce use of the roadway.

- ***Public and Private Risks of Shadow Tolling.*** Using the shadow tolling approach to fund this DBFO PPP placed the project funding risk on the Government, who needed to find various sources of revenue to pay the concessionaire the shadow tolls over the term of the contract. The concessionaire took the traffic and financing risks that the level of traffic using the new facility would be adequate to generate sufficient shadow tolls to reimburse it for the full costs of the project plus an adequate rate of return on their investment. The concession team was able to mitigate this risk because even though this was a new highway, it linked existing major trunk highways that had long histories of traffic data to support the traffic analysis for the proposed link.
- ***Potential for Excessive Private Profits from Shadow Tolling Agreement.*** Some accused the Government of using shadow tolling as a financial device that disguised government

borrowing and guarantees, with greater potential financial risks taken by the Government and greater potential financial returns accruing to the private development team. Public concerns over the potential that the shadow toll arrangement might lead to excessive profits for the concession team led the Government to place a cap on the level of shadow toll revenues that could be awarded to the concession team, provided highway usage exceeded projected traffic levels that formed the basis for the predetermined cap. This safeguarded the Government from paying excessive shadow tolls to the concession team.

- ***Managing the Complexity and Scope of the Project.*** Given the complexity and large scope of the project and the newness of the DBFO project delivery approach, this project challenged the capability of both the project's public sponsor and private development team. To address project issues promptly as a partnership, the PPP established a Project Forum to discuss and resolve various administrative and other issues that could affect the project schedule and cost during the period of project design and construction. The Project Forum included senior representatives of the sponsoring agency and the key companies comprising the project delivery force. The Project Forum was also supported by several Technical Forums that addressed more specialized areas.
- ***Concessionaire Performance Reporting and Accountability under Contract Agreement.*** With a thirty-year concession to build and operate the M1-A1 Link, the concession team is held to certain standards of performance that are reported on in their annual report. This includes such factors as traffic volume, network improvements (such as the recent installation of eight variable message signs linked to the National Traffic Control Center), maintenance (both preventive and unscheduled), emergency response, crashes, claims, equipment requirements, lane closures, and structural inspections. With the M1-A1 Link designed and built for a 120-year service life, the concession team places an emphasis on life-cycle asset management, including the introduction of innovative approaches to highway preservation, regular inspections, and programming of preventive treatments. This helps the concession team minimize lane closures, whether scheduled or unscheduled, and cost-effectively preserve the highway for its full concession contract term.

RESULTS

The M1-A1 Link was delivered ahead of schedule and on budget. As the largest and most complex of the original DBFO projects authorized by the Highways Agency in 1994, this PPP project demonstrated the capability of both the project's public sponsor and private development team to successfully deliver such a project through this alternative contracting approach. As a result, this project became the flagship example of how to apply this approach to project procurement and delivery.

With its opening, the M1-A1 Link made a significant impact on the flow of traffic from the A1 trunk road to the M1 highway and facilitated economic development between these two major north-south corridors. Traffic volumes have been sufficient to have the resulting shadow tolls adequately cover the operating, maintenance, and debt service costs of the project for the private concession team. The project is achieving its intended objectives of easing traffic congestion through the Leeds conurbation while facilitating better integration of traffic flows through the region's highway network.

CONCLUSIONS

The use of a PPP DBFO approach to project delivery and shadow toll financing expedited the completion of the project which would otherwise taken many more years to implement. As a PPP, the partners were able to initiate innovative communication and coordination methods (Project Forum and Technical Forums) to promptly address and resolve project issues as they arose. This further demonstrated the advantage of a true partnership between public sponsor and private delivery team for projects of this magnitude.

While the M1-A1 Link was able to be financed through a government-funded shadow toll with concession revenues entirely dependent on future traffic levels on the facility, later projects, such as the M6 Tollway project discussed earlier, have started to explore the replacement of shadow toll funding with direct user charges in the form of tolls. This form of revenue generation has long been used for bridges and tunnels in England, but not for roadways. This may bode a change in financing of major motorways and trunk roadways in England in the near future. Regardless of funding source, the M1-A1 Link project proved the value of the DBFO approach to project delivery when properly managed and executed.

4. TRANSPORTATION PPP CASE STUDIES AND CAMEOS FROM OTHER COUNTRIES

This chapter provides an overview of major transportation public-private partnership programs in Australia and New Zealand over the last fifteen years. This program overview is followed by several in-depth case studies of PPP highway projects from Australia and New Zealand. In addition, there are in-depth case studies of transportation PPP projects from several other countries, including China, India, Israel, and Argentina. Each of these case studies contains the following sections:

- Background
- Project description
- Partnership arrangement
- Issues and strategies
- Results
- Conclusions

The individual case studies are followed by several brief cameos of PPP projects developed in Australia and New Zealand, including both highway and transit capital projects with varying degrees of success. Each cameo briefly describes each project and the key issues and results of their development as PPPs.

OVERVIEW OF TRANSPORTATION PPPs IN AUSTRALIA AND NEW ZEALAND

Public-private partnerships have been successfully implemented in developing major highway infrastructure in Australia since the early 1990s, when the national and state governments concluded that the public sector could not deliver the level and sophistication of projects needed to expand highway capacity in a timely manner on its own. This led to numerous discussions to engage the public sector in developing, financing, operating, and preserving these additional highway assets. PPPs have been a major factor in developing Sydney's ring road network, as shown in Exhibit 4.1 on the next page.

Public-private partnerships in Australia and New Zealand have been used mainly for the development and operation of toll road projects. While PPPs have also been used to develop public transit infrastructure, in terms of financial viability, these projects have been found to be less than successful. However, social benefits may make up for the reduced level of financial viability, which is not the only measure of success for a PPP project.

Major Australian PPP projects shown in Exhibit 4.1 include the construction of the Sydney Harbor Tunnel (1992), the M4 Motorway (1992), the M5 Motorway (1992), the M2 Motorway (1997), and the Eastern Distributor (2000). Each of these facilities is a fundamental piece in Sydney's road infrastructure. Now, Sydney has the highest number of privately owned lane kilometers than any city in the world. The expected completion of the Westlink M7 Motorway (2006) and the Lane Cove Tunnel (2007) will complete the ring. Both Westlink M7 and Lane Cove Tunnel are also PPP projects.

Exhibit 4.1 Sydney's Motorway Network



Source: Maunsell of Australia, 2005

The next section contains the following in-depth case studies, listed by country:

- **Australia**
 - Sydney Harbor Tunnel
 - Melbourne CityLink
- **China**
 - Country Park Motorway - Hong Kong
- **India**
 - Second Vivekananda Bridge - Kolkata
- **Israel**
 - Yitzhak Rabin Trans-Israel Highway - Tel Aviv
- **Argentina**
 - Rosita-Victoria Bridge - Rosita, Victoria

The chapter concludes with a series of one-page cameos of the following highway and transit capital projects delivered as PPPs in Australia and New Zealand:

- Hills Motorway (M2 Motorway), Australia
- Western Motorway (M4 Motorway), Australia
- South-Western Motorway (M5 Motorway), Australia
- Eastern Distributor (Airport/M1 Motorway), Australia
- Port of Brisbane Motorway, Australia
- Roe Highway, Australia
- Graham Farmer Freeway Tunnel, Australia
- Grafton Gully Project, New Zealand
- Sydney Airport Rail Link, Australia
- Brisbane Airport Rail Link, Australia

Each cameo provides a brief description of the project and its key issues and/or results.

TRANSPORTATION PROJECT PPP CASE STUDIES FROM AROUND THE WORLD

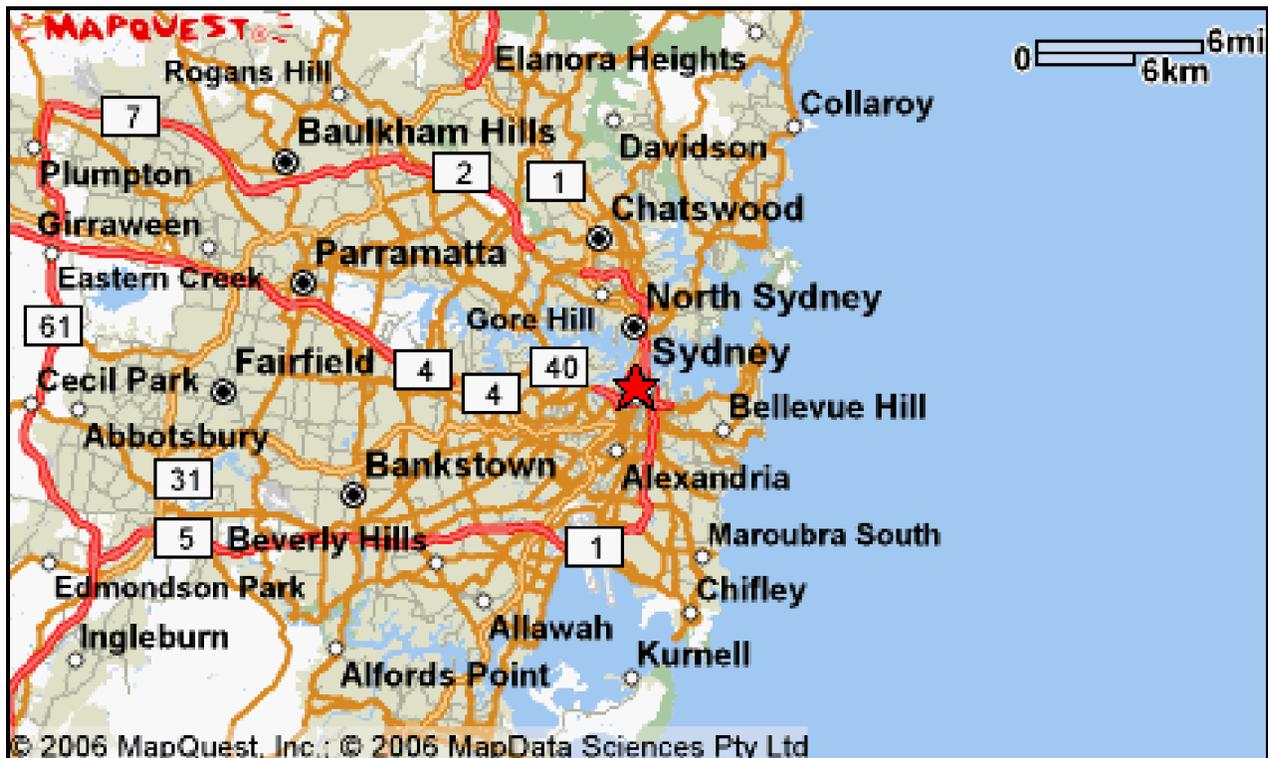
SYDNEY HARBOR TUNNEL (SYDNEY, NEW SOUTH WALES, AUSTRALIA)

PPP Delivery	Construction Period	Concession Period	Contract Value	Status
BOOT	1987 – 1992 (5 years)	1992 – 2022 (30 years)	A\$749 million	Operating

BACKGROUND

In the early 1980s, the level of traffic that could travel between the expanding suburbs of North Sydney and the Sydney Central Business District was constrained by a lack of available highway capacity across the Sydney Harbor. Traffic on the Sydney Harbor Bridge became so congested that the New South Wales (NSW) Government decided that another harbor crossing was needed. Instead of adding another bridge or expanding the capacity of the existing bridge, the Government elected to build a tunnel. However, due to a shortage of public funding for the project, the Government sought alternative funding and financing to expedite delivery of the project. Exhibit 4.2 provides an area-wide site map for the tunnel relative to downtown Sydney and the Sydney Harbor Bridge.

Exhibit 4.2 Sydney Harbor Tunnel Site Map



PROJECT DESCRIPTION

The Sydney Harbor Tunnel is a 1.4 mile long four-lane (two lanes in each direction) underwater tunnel linking North Sydney with the Sydney Central Business District. The Tunnel was constructed at a cost of A\$749M between 1987 and 1992. The Tunnel was financed and delivered through an innovative built-own-operate-transfer (BOOT) contracting approach. The BOOT arrangement was the first of its kind in New South Wales and was selected by the NSW Government to close the gap between the State's infrastructure requirements and its ability to finance these requirements. Exhibit 4.3 shows one of the two portions of the Sydney Harbor Tunnel from the travel lanes.

Exhibit 4.3 Sydney Harbor Tunnel



Source: URL: http://en.wikipedia.org/wiki/Sydney_Harbour_Tunnel

PARTNERSHIP ARRANGEMENT

The PPP arrangement for the Sydney Harbor Tunnel included the Government of New South Wales as project sponsor. The NSW Government selected the Sydney Harbor Tunnel Company Pty. Ltd. as the preferred consortium in 1987. The consortium included the Australian conglomerate Transfield together with the Japanese tunnel construction company Kumagai Gumi, each with a 50 percent stake in the Joint Venture.

The thirty-five year contract with the Sydney Harbor Tunnel Company provided for a five-year construction period and a thirty-year operating period. Hence the Joint Venture will operate the Tunnel until 2022 when it will be handed over as an asset to the New South Wales Government.

The following summarizes the major financing responsibilities of the public and private sector partners to the BOOT for this A749 million project:

- **Public Sector** - provided A\$223million (approximately 30 percent of the contract value) through an interest-free loan by the NSW Government repayable in 2022.
- **Private Sector Debt** - financed A\$506million (approximately 65 percent of the contract value) through an issue of 30-year, inflation-indexed bonds, underwritten by Westpac Bank.

- **Private Sector Equity** - The remaining A\$20million (five percent of the contract value) was provided by the joint venture partners through a loan, with full repayment made upon the completion of works. The financial plan is summarized below:

Tolls are charged on both the Sydney Harbor Tunnel and Sydney Harbor Bridge in the southbound direction (city-bound) to assist in meeting financial obligations resulting from these financing arrangements.

ISSUES AND STRATEGIES

- **High Public Sponsor Risks.** This early public-private partnership placed a significant amount of the project risk on the public sector. The NSW Government provided a minimum revenue guarantee which required its Roads and Traffic Authority to make predefined, periodic payments to project financiers. This effectively removed traffic risk from the consortium. The Government also assumed additional project risks in the form of inflation, financing, and default risks. The construction consortium assumed only the construction risks for the project. The Government was criticized by the Auditor-General for the excessive financial risks that the Government accepted for this project.
- **Gradual Shift of Future Project Risks to the Private Sector.** While the risks taken by the NEW Government in this instance appear to be excessive, they provide an indication of the risk adverse behavior of the market to PPPs when first introduced in Australia. Risk premiums were often high with initial PPPs. As the market became more familiar with PPP arrangements, the risk premium requested by the market began to fall. Hence subsequent PPP toll road projects in Sydney have resulted in a more equal sharing of risks between the Government and equity holders, in particular with respect to traffic, financing, and default risk.

RESULTS

The opening of the Sydney Harbor Tunnel has alleviated congestion with growth in traffic resuming. The Sydney Harbor Tunnel is a heavily used main arterial link and is operating satisfactorily relative to the traffic and revenue projections. Additional road capacity provided an opportunity for a dedicated bus lane to be allocated on the Sydney Harbor Bridge, which now carries more passengers into downtown Sydney during rush hour than all of the downtown lanes combined.

CONCLUSIONS

The financing structures associated with PPPs in Australia tend to be complex. This has had an impact on the delivery methods used. In this instance, ownership remains with the consortium to allow the private-sector asset providers to be able to claim depreciation for tax purposes.

MELBOURNE CITYLINK (MELBOURNE, AUSTRALIA)

PPP Delivery	Construction Period	Concession Period	Contract Value	Status
BOOT	1995 – 2000 (5 years)	1996 – 2030 (min. of 34 years)	A\$2 billion	Operating

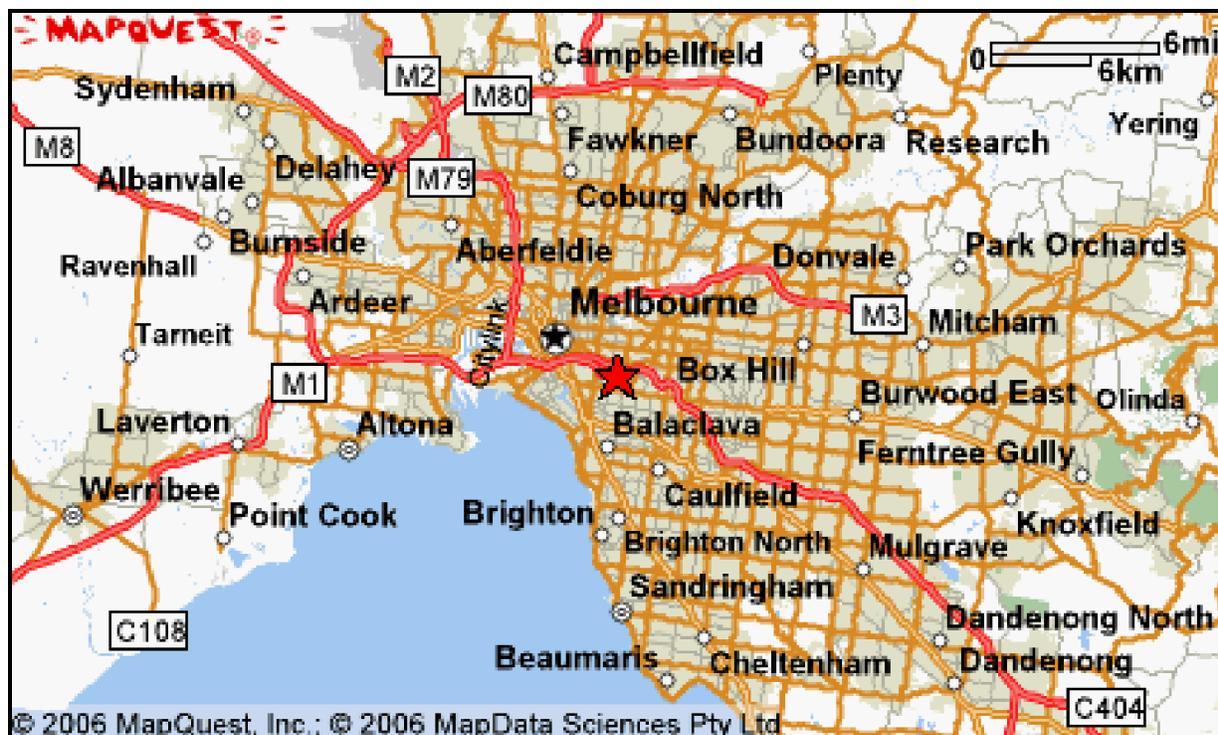
BACKGROUND

The Melbourne CityLink is one of the most advanced tolled highway systems in the world and was developed through a PPP. The project was originally designed to satisfy a number of transport objectives, including:

- Provide a freeway-standard link to connect three existing freeways;
- Facilitate the movement of traffic around downtown area; and
- Improve accessibility to major sporting, recreational facilities, and the Port of Melbourne.

Exhibit 4.4 provides an area-wide map for the Melbourne CityLink project in downtown Melbourne.

Exhibit 4.4 Melbourne CityLink Site Map



PROJECT DESCRIPTION

The Melbourne CityLink, in its entirety, is a six-lane 14-mile motorway. There are two links: the southern and western link, plus two tunnels, a bridge, and an elevated roadway. CityLink also provides seamless links to three existing freeways by connecting the Tullamarine Freeway, West Gate Freeway, and the South Eastern Arterial via two tunnels, a new 30-metre high bridge across the Yarra River, and 14 miles of new freeways. As part of building the link, parts of the Monash and Tullamarine freeways were upgraded and tolls imposed on them.

The CityLink project was constructed between 1996 and 2000. It is the largest build-own-operate-transfer (BOOT) project in Australia.

Tolls are charged by distance traveled that are then used to finance debt and pay distributions to shareholders. CityLink is Australia's first fully electronic toll road, with no toll booths and tolls collected either through transponders or license plate image recognition technology. This project was the second application of open road tolling, with the prototype installed along a major east-west bypass highway to the north of Toronto, Canada, with the development of the Express Toll Road (ETR 407) in the mid-1990s.

The project uses innovative overhead structures near residential areas instead of sound walls to significantly reduce the level of noise heard by residents of these nearby communities that is produced by users of the highway. An example of these overhead noise reduction structures are shown in Exhibit 4.5 below.

Exhibit 4.5 Melbourne CityLink Noise Reduction Structure



Source: Maunsell of Australia, 2006

PARTNERSHIP ARRANGEMENT

The Melbourne City Link Authority (a Victorian Government agency) was established in 1994 to oversee the implementation of a privately funded toll road complex through the center of the City. In 1995, it awarded an A\$2 billion 34-year concession to Transurban CityLink Limited, a private consortium comprised of Transfield, Obayashi Gumi, and Transroute.

The Transurban Corporation consists of a team of designers, underwriters and investors focused on the CityLink project. Transurban CityLink Ltd is now listed on the Australian Stock

Exchange and is currently forecast to pay for the project by collecting tolls for 34 years. The debt participants include a syndicate of banks with initial underwriting by ANZ, CBA, Westpac, NAB, BNP, Credit Lyonnais Limited and IBJ.

CityLink is Australia's largest PPP project and first of its kind in Victoria. It used the finance-design-built-own-operate-transfer (BOOT) model of project delivery. CityLink is operated and maintained by Translink, which is a joint venture between Transfield Services and Transroute.

The public and private partner roles and responsibilities for the CityLink project are summarized below:

- **Public Sector Loan:** Approximately 13 percent of the contract value was provided by the Victorian Government.
- **Private Sector Debt:** Approximately 63 percent of the contract value was financed by debt:
 - A \$120 million 19-year loan from the National Australia Bank;
 - CPI-indexed bonds; and
 - Additional debt provided by an Australian-French syndicate arranged by ANZ Bank.
- **Private Sector Equity:** The remaining 24 percent was financed through an equity raising effort, which was launched in March 1996. Shares in the toll road owner-operator, Transurban, are readily tradable on the Australian Stock Exchange.

ISSUES AND STRATEGIES

- **Public Acceptance of Tolling.** CityLink is Melbourne's first privately owned toll road. Prior to CityLink, the Government-owned West Gate Bridge was tolled. However, the toll charges were subsequently removed after public pressure.
- **Non-Compete Clause.** Transurban accepted construction, revenue, and residual risks while the Victorian Government committed to avoid developing or improving potential competing road and public transit links.
- **Implementation Problems.** PPP arrangements are long term and as such, governments need to be prepared to deal with problems with the operator. A number of operational problems initially plagued this innovative project, including:
 - Changes in toll charges;
 - Incorrect charging;
 - Failure of electronic tag transponders used to pay tolls; and
 - Treatment of tag-less toll road users.

All of these problems required various degrees of Government intervention to resolve.

- **Revenue Sharing.** Road links feeding into toll roads have the potential to provide incumbent toll operators with additional revenue. Clauses within the PPP arrangement provide for a revenue-sharing arrangement between the Victorian State Government and Transurban following any network improvements.

RESULTS

This project has improved the road network and traffic capacity in and around Melbourne by connecting three highways, providing a new bridge crossing of the Yarra River, and adding 14.3 miles of new freeways. Citylink has also provided significant benefits to the economy, in particular, time savings for freight operators. One million transponders have been issued by 2005, providing an indication of the popularity of CityLink.

A second major tolled road project has recently been awarded for the Melbourne metropolitan area (Connect East). The winning consortium was funded by Macquarie Bank.

CONCLUSIONS

PPPs provided the opportunity for the private-sector to introduce more innovative solutions. Spatial and environmental restrictions on the toll road alignment did not favor the construction of a traditional toll plaza. Electronic tolling was employed to overcome this constraint and in doing so provide the opportunity to introduce a number of entry-exit points along the toll road, all of which can be monitored as individual tolling points for applying distance-based tolling.

COUNTRY PARK MOTORWAY (HONG KONG, CHINA)

PPP Delivery	Construction Period	Concession Period	Contract Value	Status
BOT	1995 – 1998 (3 years)	1995 – 2025 (30 years)	US\$930 million	Operating

BACKGROUND

With the imminent reunification of Hong Kong with mainland China in 1997 and a policy shift to expand the nation’s economic development, the regions of the country closest to Hong Kong were expected to significantly grow in the aftermath of reunification. This was expected to result in greater travel demands between the southern provinces of China and Hong Kong, China’s gateway to the west and the most advanced capitalist part of China in the 1990s. To accommodate the projected growth in auto and truck travel between Hong Kong and mainland China, a number of highways, bridges, and tunnels were commissioned through PPPs in the 1990s and early part of this decade.

This case study discusses one of the connecting highways (Route 3 Country Park Motorway) which was developed through a Build-Operate-Transfer (BOT) PPP in the mid-1990s. The BOT PPP approach expedited project delivery to meet client schedule needs relative to the takeover of Hong Kong by China from British control in 1997. Another benefit was to expedite generation of funding from tolls to pay for the project cost over the 30 years franchise period. Due to the tight program schedule, a contractor consortium was set up for efficient construction management. Exhibit 4.6 provides an area-wide site map for the project.

Exhibit 4.6 Route 3 Country Park Motorway Site Map



PROJECT DESCRIPTION

The Country Park Motorway (Route 3) is a 12 km (7.5 mile) three-lane expressway that provides a link between Hong Kong and southern China, connecting Ting Kau and Yuen Long. The project includes twin three-lane 3.5 km (2.3 mile) tunnels below Tai Lam Country Park, 12 major bridge structures, seven pedestrian/vehicular underpasses, 10 major retaining walls, a 22-lane toll plaza, the four-level Au Tau Interchange, and construction of large-scale embankments across very soft and weak soils, 3 km viaducts at Ting Kau Interchange and Au Tau Interchange, noise barriers, traffic control and surveillance system, administration building, and ventilation buildings. The project cost \$930 million to complete and was constructed between 1995 and 1998, when it opened to traffic as a tolled highway. Exhibit 4.7 shows the highway under traffic.

Exhibit 4.7 Route 3 Country Park Motorway



Source: Maunsell, 2005 URL: <http://www.maunsell.aecom.com/MarketsAndServices/38/75/index.jsp>

PARTNERSHIP ARRANGEMENT

The core objectives of private funding for this project were to release Government funding for other purposes and to deliver road infrastructure earlier. The inclusion of the construction period within the concession period provided the concessionaires with an incentive to deliver the project as early as possible.

Six consortia submitted bids in April 1994 with the concession awarded to a consortium led by Sun Hung Kai Properties, together with China Resources, China Travel, and the Bank of China. The consortium included a number of mainland Chinese partners to mitigate as much political risk stemming from the planned handover of Hong Kong from Britain to China in 1997.

As with most BOT road projects in Hong Kong, the equity to debt ratio for the project could not exceed 65:35.

ISSUES AND STRATEGIES

- **Risk Allocation.** As with most private road projects in Hong Kong, the Government provided unencumbered land at no cost to concessionaires and developed road links to

provide access to Route 3. Interestingly, the project traverses the massive land holdings of Sun Hung Kai, the lead investor in the project. To make the package more financially attractive, the Government also financed the Tin Kau Bridge that connects Route 3 to the West Kowloon Expressway.

The consortium accepted construction risks which were then transferred to the reputable construction companies, Nishimatsu and Dragages.

- ***Role of Competition in Consortium Selection.*** The high level of interest expressed by different consortia provided the Government of Hong Kong a strong position from which to negotiate on toll road charges and bid prices. Increased participation from the private sector is likely to have been derived from three Harbor Crossing Tunnel projects in Hong Kong, all of which have been highly profitable for their operators.
- ***Non-Compete Restrictions.*** The long duration of PPP arrangements when accompanied by no-compete clauses often inhibits the ability of the Government to build additional capacity in the corridor of the project for a considerable period of time. Proponents of the Country Park Motorway have opposed the development of Route 10, which would have competed for traffic. However, the availability of longer parallel toll-free routes has reduced the profitability of Route 3.
- ***Public Sector Financial Involvement.*** The use of PPPs as a tool to finance new road projects does not completely absolve Government from making contributions. Where the scale and risk of the project is higher, Government contributions are more likely to be required. In this case, the Government contribution occurred through the donation of right-of-way to the facility and the Government-funded development of the Tin Kau Bridge and connecting roads.

RESULTS

The Country Park Motorway was designed to provide a strategic link between Hong Kong Island, Western Kowloon, the New Territories, and mainland China. It has provided much-improved road access from the Chinese boundary to the container ports and airport that have been established in north-west New Territories, while encouraging further development in this region. The annual average daily traffic during 2004 was recorded at 45,300 vehicles.

CONCLUSIONS

The political and economic development situation in Hong Kong and its geographic neighbors made development and expansion of transportation infrastructure a high priority in the mid-1990s. The use of BOT PPPs helped the region to develop and deliver major additions to its transportation systems in an expedited manner. Building these facilities as toll-funded PPPs enabled the project sponsors to accomplish this without overwhelming the budgets of either Hong Kong or China.

YITZHAK RABIN TRANS-ISRAEL HIGHWAY 6 (TEL AVIV, ISRAEL)

PPP Delivery	Construction Period	Concession Period	Contract Value	Status
Finance-Design-BOT	1999 – 2004	(30 years)	US\$1.3 billion	Operating

BACKGROUND

Despite the political and terrorist challenges to the future of the State of Israel, the country is growing and the demand for additional highway infrastructure is increasing even faster. Underlying these needs are increased population dispersion from congested urban centers such as Tel Aviv, requirements for enhanced military mobilization, and public demands for greater mobility, safety, and air quality. Exhibit 4.10 provides an area-wide site map of the project and its proximity to the major urban centers of the nation and the parallel coastal roadway network.

Exhibit 4.10 Trans-Israel Toll Highway 6 Site Map



Source: URL: <http://en.wikipedia.org/wiki/Image:Is-map.PNG>

With limited financial resources to build a major highway that links the major urban centers of the country and provides additional north-south highway capacity to more fully integrate the nation, the State turned to a series of innovative approaches to build, finance, and operate the first phase of this strategic project. These included: revenue-based debt and equity financing, project delivery using a creative public-private partnership, and the latest in toll collection technology. These innovative approaches, several of which required legislative authorization, combined to produce a project in a timely manner, with risk sharing between public and private partners, and tolling features that minimize the time required to pay the tolls. This was especially important since this was the first toll road in Israel.

PROJECT DESCRIPTION

The Yitzhak Rabin Trans-Israel Highway (Highway 6) is a four-lane 53 mile fully-electronic toll road running parallel with the coast but through the centre of Israel near Tel Aviv. The highway is Israel's only toll road and is acknowledged as the largest, most complex infrastructure project ever to have been undertaken in Israel. The project uses the latest electronic toll collection and license plate recognition technologies in combination to enable the toll road operators to collect tolls from patrons without toll booths or manual toll collection. The Trans-Israel Highway is the third toll facility built in the world that operates entirely without toll booths, otherwise known as open-road tolling. Exhibit 4.11 shows the headquarters and control center for this automated toll highway, located near Rosh HaAyin.

Exhibit 4.11 Trans-Israel Highway 6 Headquarters and Control Center



Source: URL: http://en.wikipedia.org/wiki/Highway_6_%28Israel%29

The highway, named after the former Prime Minister Yitzhak Rabin, connects Hadera with Gedera. The highway will form a part of a longer 186-mile highway, with the State commencing plans for an extension from Iron to Wadi Milek. Exhibit 4.12 displays one of the major interchanges that connects the Trans-Israel Toll Highway to the regional arterials near Tel Aviv. This interchange was constructed by the State of Israel to help expedite the overall project.

Exhibit 4.12 Major Interchange on Trans-Israel Toll Highway 6 near Tel Aviv



Source: URL: http://www.roadtraffic-technology.com/projects/highway_6/index.html#highway_62

PARTNERSHIP ARRANGEMENT

The State of Israel opted to develop and deliver the project through the formation of a PPP given the shortfall between available State funds and the urgent need for social capital infrastructure, including roads. Among the groups of firms that expressed interest in the project, four consortia of international and local firms were invited to bid for design-build-finance-operate and transfer (DBFO) project.

The winning syndicate for the concession contract was Derech Eretz, which comprised three major shareholders:

- Africa-Israel;
- Canadian Highways Infrastructure Corporation (CHIC); and
- Housing and Construction Limited.

90 percent of the project's value was financed with commercial debt. The New Israeli Shekel (NIS) syndicate provided debt financing. Deutschbank was part of the financing team that helped structure and arrange the debt financing for the project. The debt facility was syndicated with US\$850 million arranged by Bank Hapoalim and US\$250 million arranged by Tyco Group. Debt financing was structured such that margins would increase over the term of the facility to allow for low toll charges to be applied during the early stages of the concession.

The remaining 10 percent (US\$120 million) was funded by a complex equity arrangement, which was phased to cover actual construction costs as they occurred. A 10-year block on dividends was also imposed to ensure that toll charges initially remained low.

ISSUES AND STRATEGIES

- **Revenue Risks.** The State of Israel assumed much of the revenue risk for the project, where revenues would be supplemented with Government funds if revenues fell below projections due to lower-than-expected patronage. According to the PPP concession arrangement, the State agreed to pay the consortium 80 percent of the difference between actual and projected revenues whenever a shortfall occurred.

In accepting the downside risk of revenue shortfalls, the PPP concession arrangement allowed the State to share a portion of any “super profits” that resulted when road use exceeded projections. Under this arrangement the State would receive 57 percent of the positive difference between actual and projected revenues from the consortium.

Furthermore, the concession arrangement provided the State the option to acquire up to 49 percent of Derech Eretz, exercisable between construction completion and the end of the concession period.

- **Construction Risks.** The State acquired the right-of-way parcels required for the entire project. The State also constructed two major interchanges along the highway alignment to expedite the project schedule. All other construction risks were borne by the consortium.
- **Project Expansion Requirements and Risks.** The concession agreement requires the consortium to enhance the capacity of the highway when certain traffic volume/congestion triggers are reached, with funding for these improvements coming from a dedicated reserve fund derived from excess facility revenues. If the project expansion reserve funds are insufficient to cover the costs of the required capacity improvements, further equity payments are required from the consortium to off-set the difference.
- **Toll Collection Risks.** Prior to this project, the State lacked the legal authority to allow private sector operators of highways to impose direct user charges collected through tolls, as well as the ability to enforce toll payments by fining those who use the facility without paying the appropriate tolls. This was particularly important for this project since it used an open road tolling approach that eliminated toll booths and relied on electronic toll collection (through the use of transponders in the vehicles for those wishing to use (ETC) or by issuing patrons a bill by mail that included both the cost of the toll and an administrative fee. These follow-up bills are issued to individuals whose license plates identified using photo-recognition technology.
- **Financing Risks.** Given the unusually large size of the project, major delays were incurred in finalizing the concession when the financial syndicate for the project faced major difficulties raising the funds in the capital markets. This was eventually overcome by diversifying the debt syndication structure for the project and limiting the debt portion of the financing to 90 percent.
- **Legal Requirements.** Legislation was also required to provide a private sector operator with the power to collect tolls and where necessary to enforce toll payments.

RESULTS

The toll road was progressively opened from August 2002, with the entire highway opened in January 2004. The performance of the toll road relative to traffic and revenue projections has been positive, with annual double-digit patronage growth. In 2004, average daily patronage was approximately 70,000 vehicles.

CONCLUSIONS

It is intended that the Yitzhak Rabin Highway will reduce traffic flows and congestion on parallel routes, including Road 4 (Geha Road) and Road 2 (the Coastal Road). It is envisaged that traffic will divert to the central region of the country in order to reduce vehicle density, pollution, and crashes in the greater Tel Aviv region.

SECOND VIVEKANANDA BRIDGE (KOLKATA, INDIA)

PPP Delivery	Construction Period	Concession Period	Contract Value	Status
BOT	2004 – 2007 (3 years)	(30 years)	US\$148 million	Under construction

BACKGROUND

The Second Vivekananda Bridge will form a part of the Indian national highway network, connecting with the Durgapur Expressway. The bridge will effectively provide a northern bypass to the City of Kolkata (Calcutta) and assist with the movement of traffic to North Bengal and Bangladesh. Exhibit 4.8 provides an area-wide site map for the geographic location of the bridge, which is still under construction.

Exhibit 4.8 Second Vivekananda Bridge Site Map



PROJECT DESCRIPTION

The Second Vivekananda Bridge is a 3.8 mile six-lane bridge over the River Hoogly near Kolkata. The bridge is parallel to the first bridge, an untolled two-lane bridge built in the 1930s. Exhibit 4.9 displays an artist's rendering of the multi-pier, cable-stayed bridge.

Exhibit 4.9 Second Vivekananda Bridge Profile



See: URL: http://en.wikipedia.org/wiki/Vivekananda_Setu

PARTNERSHIP ARRANGEMENT

The financing gap between Government funds and road requirements has sharply increased, following high levels of economic growth and consequential increase in demand for quality road capacity. To help bridge the gap in funding availability and transportation infrastructure needs, the Government elected to build the bridge using the PPP method of project delivery known as Build-Operate-Transfer or BOT.

The Government selected the Second Vivekananda Bridge Tollway Company Limited (SVBTC) as the preferred consortium from among a group of interested teams. The SVBTC is a special purpose vehicle led by the Asian Infrastructure Development Corporation (US), Stradic (Philippines), and L&T. The BOT contract is valued at US\$148 million.

The Second Vivekananda Bridge is the first road project in India that is using foreign funds, both debt and equity, to finance construction of the facility.

ISSUES AND STRATEGIES

- **Financing Challenges.** Given the infancy of PPP projects within India, both national and local governments have provided a number of tax concessions to attract private

sector funds for road development in India. In this instance, the State provided Rs 30 crore¹⁵ (300,000,000 rupees) for project-related infrastructure development.

- ***Risks of Introducing Tolling.*** Since the development of privately-owned toll roads is a new phenomenon within India, the first toll road projects have been relatively small. Profitability of toll road projects thus far has been primarily dependent on returns from associated real estate development.
- ***Expanding Private Sector Participation.*** The liberalization of the economy has resulted in a noticeable increase in private sector participation in the construction and operation of highways in India. The Indian Government has introduced measures to improve the road network, in particular, by:
 - Attracting private sector financing, including providing rights to collect and retain tolls for BOT projects;
 - Allowing 100 percent of a road project to be funded using foreign sources; and
 - Providing generous tax exemptions on earnings and construction equipment.

RESULTS

It is projected that traffic levels on the Second Vivekananda Bridge will reach 80,000 vehicles per day after the initial ramp-up period. On completion in 2007, the bridge should assist in alleviating congestion in the northern parts of Kolkata.

CONCLUSIONS

Despite the need for this vital transportation link around the City of Kolkata, it took PPP project delivery using the BOT approach and innovative financing to advance the project in a timely manner. This included leveraging scarce public funding dedicated to the project by the State by using foreign debt and equity financing to construct the project, to be repaid by tolls collected from patrons of the bridge. The project also benefited financially through the use of value capture from nearby economic development that will benefit from the improved accessibility expected to result from the additional mobility and capacity provided by the bridge once completed and operational.

¹⁵ One crore is equivalent to 10 million (10,000,000)

ØRESUND BRIDGE AND TUNNEL (DENMARK TO SWEDEN)

PPP Delivery	Development/ Construction Period	Concession Period	Contract Value	Status
Design-Build	1992 – 2000	N/A	US\$5.4 billion	Operating

BACKGROUND

The Øresund Bridge was completed and opened to traffic in July 2000, but ideas for a fixed link connecting Sweden and Denmark across the Øresund Sound had been discussed since the late nineteenth century. Serious proposals for a Copenhagen-Malmö link were raised in 1930, but they never got beyond the planning stages as international uncertainty increased in the years before World War II. Following the war, Nordic politicians searched for ways to encourage greater economic and political cooperation among their countries, including the formation of a Nordic Council and a Nordic passport union in the mid-1950s. Buoyed by these events, in 1954 an earlier bridge proposal was resuscitated and revised, but disagreements over the bridge's location undermined that plan.

The impetus for an Øresund Sound crossing decreased in the 1960s and 1970s as Denmark focused on increasing its ties to the rest of mainland Europe and expanding the market for its agricultural exports, and Denmark joined the European Economic Community (the forerunner to the European Union) in 1973. However, despite the prior difficulties in finding an acceptable location for a crossing of the Øresund Sound, the potential benefits of such a project caused proposals to continue to be advanced. Crossings were examined at various locations, including a rail tunnel between Elsinore (DK) and Helsingborg (SE), which are further to the north where the Øresund Sound is narrower.

The situation finally changed in 1986 when Denmark decided (after many decades of similar hesitation) to proceed with the construction of the Great Belt Fixed Link. The Great Belt link, which opened to rail traffic in 1997 and road traffic one year later, connects the Danish island of Zealand (which includes Copenhagen) to the island of Funen to the west, which then connects on to Jutland and the road and rail networks of mainland Europe. With the Great Belt project underway and a rail link between France and England established in 1995 with the opening of the tunnel under the English Channel, the Øresund Sound then remained as the only barrier to a seamless and integrated European surface transportation network.

PROJECT DESCRIPTION

The Øresund Bridge (previously known as the Øresund Fixed Link) is a 16 kilometer (10 mile) link carrying both highway and railroad traffic across the Øresund Sound between Copenhagen, Denmark, and Malmö, Sweden. The link includes a four kilometer immersed tunnel; an eight kilometer, two-deck bridge; and a four kilometer artificial island (called Peberholm) where the traffic transitions between the tunnel and the bridge. The bridge itself is comprised of a three kilometer western approach and a four kilometer eastern approach joined by a one kilometer cable-stayed bridge. Exhibit 4.6 provides an area-wide site map for the project.

Exhibit 4.8 – Øresund Fixed Link Site Map



Source: "Facts worth Knowing about the Øresund," Øresundsbron, 2006 URL: www.oeresundsbron.dk

The cable-stayed bridge section, which has the longest main span in the world at 490 meters, provides high clearance for ships in the navigation channel below. On the bridge sections, the two-track railway runs on the lower deck and the four-lane roadway runs on the upper deck, while the road and rail run in four side-by-side tubes in the tunnel section. Figure 4.9 below shows the double-deck high bridge and approaches crossing the Øresund Sound.

Exhibit 4.9 Øresund Bridge Main Span and Approaches

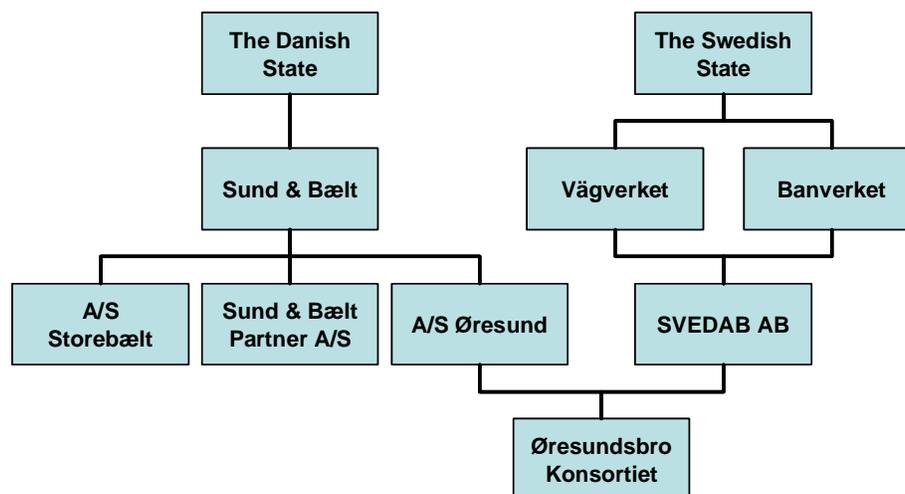


Source: Graham Gedge URL: <http://corrosion-doctors.org/PaintCoatings/gedge.htm>

PARTNERSHIP ARRANGEMENT

The Øresund Bridge is owned and operated by the Øresundsbro Konsortiet, a client company that was set up by the Danish and Swedish governments. The partnership arrangement is essentially a public-public partnership between two sovereign nations, which assumed full traffic and revenue risk for the project. The full organizational structure, as shown in Figure 4.10 below, is complex, with the stock of Øresundsbro Konsortiet being equally owned by the Danish holding company A/S Øresund and the Swedish holding company SVEDAB AB, which in turn are controlled by the Danish and Swedish transportation ministries.¹⁶

Figure 4.10 - Øresund Bridge Organizational Structure



Source: "Facts worth Knowing about the Øresund," Øresundsbron, 2006 URL: www.oeresundsbron.d

According to the agreement between Denmark and Sweden, the two holding companies (A/S Øresund and SVEDAB AB) are each responsible for the ownership and operation of the landworks (e.g., access roads and connecting rail tunnels) on their respective sides of the bridge. The Øresundsbro Konsortiet is then responsible for the management and operation of the bridge, including toll collections, road operations, maintenance, and administrative functions (e.g., marketing, finance, and customer service). The overall management of the rail line also lies with Øresundsbro Konsortiet, but the railway agencies control the capacity and day-to-day operations of that part of the Øresund link.¹⁷

ISSUES AND STRATEGIES

The Danish and Swedish governments, together with their private sector partners, faced an array of challenging issues in constructing and then operating the Øresund Bridge. Some of these issues were successfully surmounted, while others continue to impede the financial stability of the project. The key issues and strategies to address them are described below:

¹⁶ In Figure 4, "Vägverket" and "Banverket" are the Swedish road and rail authorities, respectively, while "Sund & Bælt" is the Danish authority which oversees the major Danish island linkages. A/S Storebælt (far left of Figure 4) acts as a holding company for the Great Belt Fixed Link, much as A/S Øresund does for the Øresund Bridge.

¹⁷ The national railway agencies of the two countries pay a fixed (indexed) sum to Øresundsbro Konsortiet for the right to use the railway on the link. The agencies then sell capacity on the link to rail operators.

- **Design-Build:** The use of a Design-Build procurement approach was one of the most successful decisions of the Øresund Bridge project. The Øresund Bridge presented a range of difficult technical challenges, and the entire project was constrained by demanding environmental requirements both during construction and after completion. The national governments were able to define their performance standards (for both the road/rail traffic and the environmental requirements), and the private sector responded with innovative design, fabrication, and mitigation approaches. For projects where sponsors face difficult design requirements but can define their ultimate needs as measurable standards, Design-Build can be a very attractive approach.
- **Risk Analysis of Costs and Revenues:** The national governments were assured in 1991 that the Øresund Bridge would be self-financing, but the Danish Auditor-General later determined that the Transport Ministry had done four appraisals of project viability, and each concluded that only minor variability from the projected costs and revenues was required to make the project non-viable (i.e., unable to pay back its costs in the 30-year time frame). As it turned out, such variability was likely and the project is not expected to meet its 2030 payback goal unless traffic growth in the next 20 years is very strong. In the meantime, taxpayers in the two countries must make up the difference. It is critical in such projects that reasonable ranges of outcomes be explored and understood from the outset, so that decision-makers can determine whether to proceed as planned or whether to make design or performance changes in response to the possible range of outcomes.
- **Timeframe for Self-Sufficiency:** For a new project of the magnitude of the Øresund Bridge, the 30-year target for project self-sufficiency may have been too low and raised unrealistic expectations among sponsors, the financial community, and the public. Facilities such as this typically have service lives of 100 or more years, yet are expected to fully pay for themselves in only 30 years. This is driven more by the nature of traditional debt financing instruments used in Europe than the nature of the infrastructure asset.
- **Entry into an Established Competitive Market:** The Øresund Bridge was a new entrant to an established transportation market consisting of multiple ferry service operations. Potential customers for the bridge were accustomed to these ferry services which had a distinct cost advantage, especially for truck traffic. These factors have undermined the traffic and revenue projections for the bridge in its early, ramp-up years of operation. Over time, competing ferry services may reduce operations or go out of business entirely as more auto and rail patrons choose to use the Øresund Bridge due to its greater reliability. However, it is expected that some form of ferry service will continue as an alternative to the bridge to preserve a back-up in case of bridge or tunnel failure, adverse wind conditions that force the closure of the high bridge (which may also curtail ferry operations), or other emergencies or incidents.
- **Environmental Impacts:** Environmental groups in the Nordic countries have significant influence on public policy, and the Øresund Bridge project was no exception. In this case, the influence went beyond issues like monitoring of impacts to actually dictating the alignment of the link and some of the basic performance specifications of the facility (relating to water flow). Despite these constraints, the project was successfully completed and is now seen as a model of environmental sensitivity and protection. In projects of this size and complexity, environmental impact concerns will naturally be addressed in the

planning process, but if the concerns can be translated into specific performance standards, then the design process can incorporate the standards from the outset.

RESULTS

The Øresund Fixed Link connects Denmark with Sweden across in the Øresund Sound. This multi-modal bridge-island-tunnel facility provides the final link in connecting the counties of Western Europe now part of the European Union. The project experienced cost overruns of 25 percent for the coast-to-coast sections of the Øresund Bridge and over 70 percent for the landside infrastructure than first projected and ultimately represented one-third of the total project cost. This can be attributed in part to “scope creep,” where the landside road and rail projects grew far beyond their original dimensions.

Initial traffic on the facility came in well below projected levels, thereby lowering the amount of revenue produced by the facility. Planning projections estimated 10,000 vehicles per day for the roadway in the opening year, along with 16,500 to 19,000 rail passengers. But in calendar year 2001 (the first full year of operation), even after a toll reduction, the average daily traffic was only 8,100 road vehicles and 13,400 rail passengers. This was due in part from stiff competition from ferries that have traditionally operated on the Sound, especially for commercial freight traffic seeking a lower-cost alternative. However, the facility is still fairly new, and the typical ramp-up period for traffic growth has not had time to be fully realized.

Because of the higher costs and lower initial revenues, the “self-financing” of the facility is currently in doubt. Even under a high-growth scenario, with aggressive assumptions about regional economic growth and trip-making, the facility will not likely be repaid until 2029 or 2030. Under more moderate assumptions, that period extends to 2035, and under a “stagnation” scenario (where traffic growth has slowed to 1% per year by 2025), the period extends to 2046 and beyond.

CONCLUSIONS

When the Øresund Fixed Link was opened to traffic in 2000, the Øresund Sound then remained as the only barrier to a seamless and integrated European surface transportation network. To move the project forward, the Øresund Bridge was promoted by its government supporters as a “self-financing” facility, able to fund all costs from road and rail usage fees over a 30-year timeframe. On the basis of these assurances, construction was financed in the international capital markets through loans guaranteed by the two national governments which bore the full traffic and revenue risks of the project.

The self-financing of the bridge is now in doubt, due to both construction cost overruns and lower-than-expected traffic volumes. In particular, trucks predominately use competing sea ferry services to reach the Swedish peninsula. However, the Øresundsbro Konsortiet did take a leading role in utilizing public-private partnerships for design and construction, and the bridge was one of the first projects of this scale in Europe that was delivered through a series of Design-Build contracts. This approach produced a number of innovations in design, fabrication, and environmental mitigation for the bridge.

From the outset, the Øresund Bridge was conceived of not simply as an infrastructure project, but as a “statement” about environmental protection, economic development, and international relationships. In most respects, the project has promoted these goals as it seeks to attain financial self-sufficiency.

ROSARIO-VICTORIA BRIDGE (ROSARIO/VICTORIA, ARGENTINA)

PPP Delivery	Construction Period	Concession Period	Contract Value	Status
DBOM	1997 – 2002	(25 years)	US\$385 million	Operating

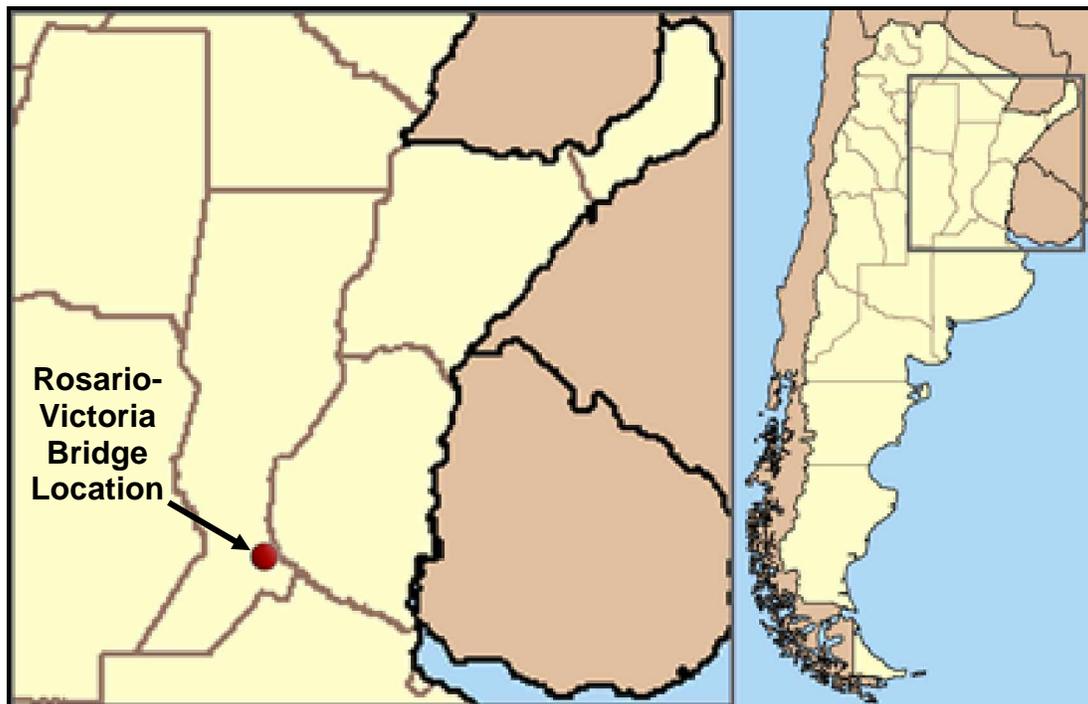
BACKGROUND

The Mesopotamia Provinces are located in the northeastern part of Argentina and are the principal location for much of Argentina's commercial and industrial activity. A major impediment to the further economic development of the region and access to the rest of the nation was the lack of adequate transportation infrastructure to transport people and particularly goods between these provinces and to the rest of Argentina.

By the early 1990s, the Government of Argentina recognized the need to improve accessibility between several of these provinces heretofore cut off from direct connection by a major river valley. What was needed was a way to span the river valley so that highways built from either end of the bridge would enable direct vehicular access. The solution was to build a major bridge that could provide a direct connection between the capital cities of the Province of Santa Fe and the Province of Entre Rios. A major dilemma was how to fund and operate that resulting bridge facility.

Exhibit 4.13 provides an area-wide map showing the geographic location of the bridge within the northeast Mesopotamia Provinces of Argentina.

Exhibit 4.13 Rosario-Victoria Bridge Site Map



Source: URL: http://en.wikipedia.org/wiki/Rosario-Victoria_bridge

PROJECT DESCRIPTION

The bridge facility selected by the Government of Argentina to integrate the Mesopotamia Provinces and the rest of the nation was the Rosario-Victoria Bridge, named after the two provincial capitals it would directly link (Rosario is the capital city of Santa Fe Province and Victoria is the capital city of Entre Rios Province). The bridge forms part of a multi-lane roadway that extends for 37 miles in the northeastern part of Argentina.

The selected design concept called for lengthy column-supported approaches linked by a cable-stay bridge with a main center span of 1,083 feet and a clearance of 165 feet over the Paraná River Valley. The bridge used twin towers with cables supporting the outer edges of the bridge deck on either side of the towers. Exhibit 4.14 shows the completed cable-stayed bridge and approach ways.

Exhibit 4.14 Rosario-Victoria Bridge



Source: URL: http://en.wikipedia.org/wiki/Image:Puente_Rosario-Victoria_%28panorama%29_3.jpg

PARTNERSHIP ARRANGEMENT

With project costs estimated to be somewhere between one-quarter and one-half billion dollars, the Government required additional financial resources to close the gap between what it could contribute on its own to the project and the ultimate cost once completed. The Government also sought a design and construction approach that would most cost-effective, and a project delivery approach that would minimize the risks of cost overruns. Therefore it decided to undertake the bridge project using a design-build-operate-maintain (DBOM) contract delivery approach, with equity participation by the successful contractor.

Following a competitive bidding process, the Government of Argentina through the Minister of Economy and Public Works awarded a concession to the Puentes del Litoral SA consortium comprising of a number of local and international construction companies: Impregilo SPA (Italy), Iglys SA (subsidiary of Impregilo), Hochtief AEG (Germany), Techint SACEI (Argentina) and Benito Roggio e Hijos SA (Argentina). During the project development phase of the concession contract, the concessionaire took ownership of the facility as it was being designed and built. Subsequent to the completion of the bridge, the ownership was transferred to the Federal Government.

The relative participation in the \$430.8 million project by its three principal financing partners is described below:

- **Public Sector:** The Government contributed US\$207 million (48%);
- **Private Sector:** The Puentes del Litoral SA consortium provided US\$150 million (35%); and
- **International Financial Institution:** The Inter-American Development Bank (IDB) provided two loans totaling \$US73.8 million (17%), divided as follows:
 - US\$33.1 million loan from the Bank’s ordinary capital; and
 - US\$40.7 million syndicated loan from funds provided by commercial banks with subscription of participation agreements with the IDB.

The Federal Government instituted tolls on the bridge to cover debt service costs associated with project financing for bridge development, operations, maintenance, and life-cycle preservation.

ISSUES AND STRATEGIES

- **Revenue and Construction Risk.** The proposed bridge project was a major undertaking by the Federal Government in association with the directly impacted provinces, involving the construction of a new highway and bridge link between these two provinces. This posed a significant revenue risk to the project partners since the level of traffic that would use the tolled facility and the revenues that would be produced was uncertain. In addition, the large amount of capital required for this ambitious project and the novel design proposed for the bridge presented construction risks to the members of the DBOM TEAM. While the full allocation of various project risks is unknown, the Government’s commitment of public funds to finance almost half of the project development costs significantly mitigated the revenue risk as well as the construction risk to the project partners.
- **Untried Stakeholder Relationships.** The unique nature of this PPP project for the Argentina Minister of Economy and Public Works required a whole new set of project stakeholders to effectively work together as an integrated team to accomplish the project objectives within the limited total budget and desired schedule. To their credit, the Federal and Provincial Government agencies established effective working relationships as project sponsors and developed successful commercial relationships and risk sharing with local, national, and foreign investors, construction companies, and operators comprising the overall public-private partnership.

RESULTS

Following completion of the bridge, average travel times and vehicle operation costs have declined significantly between the two key provincial capitals while the capacity to handle additional freight and passenger traffic has significantly increased. The bridge has also promoted greater integration between the northeastern provinces as well as with the South American Common Market.

CONCLUSIONS

The emergence of PPPs and toll-funded facilities developed through innovative project delivery approaches has enabled several countries in South America to expedite opening critical highway linkages that promote improved mobility between once isolated regions or over-congested metropolitan areas. These countries include Argentina, Brazil, Chile, Columbia, Peru, and Mexico. These expedited investments in transportation infrastructure have fostered greater economic development on a regional and national level. PPPs have become the contracting vehicles for enabling these benefits to occur in a timely manner.

**CAMEOS OF SURFACE TRANSPORTATION PPP PROJECTS IN AUSTRALIA AND
NEW ZEALAND**

HILLS MOTORWAY (M2 MOTORWAY)

Sydney, New South Wales, Australia

The \$650 million M2 Hills Motorway opened six months ahead of schedule in May 1997 after a three-year design and construction period. Exhibit 4.15 shows the Epping Ramps and Tunnel on the completed M2 Motorway.

Exhibit 4.15 Epping Ramps and Tunnel on M2 Motorway



Source: Maunsell of Australia, 2006

The Abigroup-Obayashi Joint Venture was the construction contractor, on behalf of Hills Motorway Limited. Hills Motorway entered into a formal agreement with the NSW Government to build, own, operate and, ultimately, transfer the M2 back to the Government at the end of a 45-year term.

The construction cost will be paid off through toll revenue over the term of the concession and all operating costs will be met by Hills Motorway over this period. Hills Motorway Limited has overall control and ownership of the Motorway and was a public company listed on the Australian Stock Exchange up to May 2005.

The Motorway is operated by Tollaust Pty Limited, a company that is jointly owned by Abigroup and EGIS, under an operating and maintenance contract with Hills Motorway Limited. Tollaust is responsible for collecting the tolls and operating and maintaining the M2 Motorway as well as the electronic tolling systems. The Macquarie Infrastructure Group helped fund the project. The concession ends in 2042.

Issues/Results: The M2 is performing satisfactorily in terms of traffic volumes and revenue as Hills Motorway Limited. Transurban, the owner-operator of Melbourne's CityLink, have recently acquired a controlling interest in the motorway. The M2 Motorway is a strategic asset for Transurban, which feeds traffic into the Westlink M7 Motorway opened in April 2006.

WESTERN MOTORWAY (M4 MOTORWAY)

Sydney, New South Wales, Australia

The M4 Western Motorway is the road traffic spine for the western suburbs of Sydney, extending a distance of 24.9 miles from Concord at its eastern end, through to Lapstone to the west of Penrith. Exhibit 4.16 shows the M4 Motorway in Prospect.

Exhibit 4.16 M4 Motorway in Prospect



Source: Maunsell of Australia, 2005

The first section of the M4 Motorway was from Prospect to Penrith, completed by the NSW Government during the early 1970's. Several stages of the second section from Concord to Parramatta were completed in the 1980's. There remained a missing link of about 6.2 miles between Mays Hill (outside Parramatta) and Prospect to connect these two sections.

In 1989 the NSW Government invited proposals from private enterprise for the funding and construction of this missing link, and upgrading another 6.8 miles of the F4 Freeway. In open competition, Statewide Roads Limited won the right over a 20-year period to finance and build, and then operate and maintain the Motorway, after which the Motorway reverts to the Government at no cost. Macquarie Infrastructure Group owns 50.6% of Statewide Roads. Also awarded in this concession agreement was the right to develop and sub-lease two service centers at Prospect. These are currently being leased by SWR to McDonalds, Red Rooster, and Caltex. The concession ends in 2010.

The M4 Western Motorway opened in May 1992 and consisted of 6.2 miles of new dual carriageway expressway, 21 major bridge structures, and to upgrade and widen 6.8 miles of existing expressway at a cost of A\$245 million. The completion of this section provided uninterrupted urban motorway conditions between Concord and Lapstone in Sydney's west.

In response to the success of the initial project, Statewide Roads undertook the upgrade and widening of the M4 Western Motorway from Parramatta to Penrith during the period 1996 to 1998. This involved the construction of an additional 43.5 lane miles to bring the road from four to six lanes, and in some areas eight lanes.

Issues/Results: There was considerable political pressure to remove the tolls prior to the 1996 NSW State Election. Upon election, the NSW Government subsequently implemented the "Cashback" scheme to refund tolls to all private-car toll trips in lieu of removing tolls. This innovation was the result of complex financial arrangements which allowed the toll road operators to derive considerable tax benefits. The implementation of shadow tolling would have seen these tax benefits lost. The State Government recently called for expressions of interest for the construction (through a PPP) for the final extension of the M4 to connect to the Sydney CBD.

SOUTH-WESTERN MOTORWAY (M5 MOTORWAY)

Sydney, New South Wales, Australia

The project consists of an A\$230 million 9-mile tolled motorway in Sydney's south-west that opened in August 1992. The tollway extends from King Georges Road in Beverly Hills to Moorebank Avenue in Casula. The motorway provides a direct link from Sydney's south-western suburbs to the airport, port, and Sydney CBD. Exhibit 4.17 shown toll booths on the M5 Motorway

Exhibit 4.17 M5 Motorway Toll Booths



Source: Maunsell of Australia, 2005

The project was delivered via a build own operate transfer partnership by InterLink Roads Pty Ltd under a lease that expires in 2023. This was Leighton Contractors first major privatized infrastructure project. Interlink's owners are Macquarie Infrastructure Group(50%), Retail Employees Superannuation, Sunsuper and interests associated with Hastings Funds Management, the Development Australia Fund and the AMP Infrastructure Equity Fund. The M5 was opened well ahead of schedule and on budget.

Issues/Results: The motorway operators benefited considerably from the flow of traffic from the M5 East Motorway, an eastern extension to the M5 Motorway, which was fully funded by Government with no tolls applied on users.

The motorway is severely congested in AM peaks inbound to the Sydney CBD. Plans are being developed to provide an additional tunnel that would likely operate in a "tidal flow" format to provide additional capacity.

EASTERN DISTRIBUTOR (AIRPORT/M1 MOTORWAY)

Sydney, New South Wales, Australia

The Eastern Distributor is an A\$700 million project that included the design, construction, operation, and maintenance of a 3.7 mile stretch of toll road and tunnel. The facility links Sydney's city center with the airport and provides a link between the northern and eastern suburbs of Sydney.

The Eastern Distributor is an important link in Sydney's orbital road network, joining Southern Cross Drive, the M5 East, The Harbor Bridge, the Harbor Tunnel, and the recently opened Cross City Tunnel, giving motorists direct connections across the city. The road is owned and operated by Airport Motorway Limited.

The three-year project was completed eight months ahead of schedule in December 1999. The major shareholder in Airport Motorway Limited is Macquarie Infrastructure Group (71.35 percent); the remainder owned by the constructor Leighton as well as superannuation funds (401k funds) Unisuper and MTAA. The term of private ownership is 48 years.

Issues/Results: The unique double-deck tunnel configuration is considered the widest unsupported tunnel span roadway. Exhibit 4.18 shows the tunnel portals for the Eastern Distributor.

Exhibit 4.18 Eastern Distributor Tunnel Portals



Source: Maunsell of Australia, 2005

PORT OF BRISBANE MOTORWAY

Brisbane, Queensland, Australia

The project consisted of the design and construction of 3.1 miles of motorway; 14 major new bridges; a multi-level 50 mph interchange over the Gateway Motorway; modification of four existing bridges with associated embankments and pavements. Exhibit 4.19 shows the toll plaza for the motorway.

Exhibit 4.19 Port of Brisbane Motorway



Source: Maunsell of Australia, 2005

This A\$196million road link project was delivered by the Port of Brisbane Motorway Alliance, comprising the State Government-owned Port Motorway Limited, Leighton Contractors, Parsons Brinkerhoff, and Coffey Geosciences.

The project was funded by the Queensland State Government, the state owned Port of Brisbane Corporation and the Federal Government.

Issues/Results: The motorway was officially opened in December 2002, six months ahead of schedule and \$20m under budget with Queensland Motorways Limited being responsible for the ongoing operational management of the Port of Brisbane Motorway as part of a franchise agreement with the State Government.

ROE HIGHWAY

Perth, Western Australia, Australia

Roe Highway is a vital component of Perth's arterial road network that links the national highway "gateway", near Midland, with the strategic industrial areas of Forrestfield, Kewdale and Canning Vale, and south to Kwinana and beyond. Exhibit 4.20 shows the Roe Highway near Kenwick, outside of Perth.

Exhibit 4.20 Roe Highway near Kenwick



Source: Maunsell of Australia, 2006

When completed, this major artery will span from Tonkin Highway to Kwinana Freeway. Roe Highway Stages One to Six are complete with Stage 6 opened in April 2004. Roe Highway Stage Six is a 2.8 mile extension to Roe Highway and was delivered by a John Holland-McMahon Joint venture with Main Roads Western Australia.

Issues/Results: Roe Highway Stage Seven is being managed by the first integrated client-contractor alliance in Western Australia's road industry. The Roe Seven Alliance was formed in October 2003 and the participants include Main Roads Western Australia, Clough Engineering Limited, Henry Walker Eltin Contracting Pty Ltd, and Maunsell Australia Pty Ltd.

GRAHAM FARMER FREEWAY TUNNEL *Perth, Western Australia, Australia*

The Graham Farmer Freeway Tunnel project provides a link between the Great Eastern Highway and Mitchell Freeway, improving traffic flow between the east/south-east and the northern suburbs.

Stage One, the major section of the project, comprised works from the west side of the Swan River through to the Mitchell Freeway connection. The main feature of Stage One is a one mile, six-lane tunnel through Northbridge, the entertainment heart of Perth. Exhibit 4.21 shows the tunnel portals of the Graham Farmer Freeway.

Exhibit 4.21 Graham Farmer Freeway Tunnel Portals in Perth



Source: Maunsell of Australia, 2005

Baulderstone Hornibrook in joint venture with Clough Engineering constructed Stage One of Perth's City Northern Bypass Project, now known as the Graham Farmer Freeway. The Joint Venture are also operating and maintaining the tunnel for a period of ten years under a contract with Main roads western Australia.

Issues/Results: Stage 3, the interchange road works at Great Eastern Highway, was also constructed by Baulderstone Hornibrook under a separate contract. The whole project covered 4 miles, cost A\$340million, and was officially opened in April 2000.

GRAFTON GULLY PROJECT

Auckland, New Zealand

This project forms Stage 1 of the Central Motorway Improvement Project, which is an integral part of Transit New Zealand's overall strategy for easing traffic congestion in central Auckland. The project comprises new links that provide direct access between the Northern Motorway, Grafton Gully, and the Port of Auckland. It also improves access to the lower CBD, Auckland Hospital, and Mission Bay. Exhibit 4.22 illustrates the extent of the Grafton Gully project and its location relative to the Port of Auckland.

Exhibit 4.22 Grafton Gully Central Motorway



Source: Maunsell of Australia, 2005

The NZ\$68m project is the first of the three Central Motorway Improvement projects to be completed took and was completed well ahead of schedule and under budget in February 2004. The project was delivered by the Freeflow Alliance, which is a Project Alliance consisting of the project owner Transit New Zealand, Beca Carter Hollings & Ferner, Fletcher Construction and Higgins Contractors.

A Project Alliance is a new form of contracting between an owner, the designers and constructors. Members take collective ownership of the project risks and rewards with incentives provided to encourage outstanding performance. There are also penalties if performance is below standard. Success is not measured by cost performance alone. Additional key performance areas include risk management, traffic management, environmental management, safety management, community relations, early start and timeliness of completion.

Issues/Results: The Auckland isthmus limits the number of land access routes into and out of the Auckland Central Business District. Capacity improvements are seen as desirable but funding out of consolidated revenue and from fuel taxes are projected to fall short of the capital required for these improvements. Further study of PPP opportunities by the NZ Government is expected.

SYDNEY AIRPORT RAIL LINK

Sydney, New South Wales, Australia

This project provided a new 6.2 miles railway, almost entirely underground, running from downtown Sydney through the Inner South suburbs and Sydney Kingsford Smith Airport to join the CityRail Illawarra Line at Turrella. Five new stations were built including two at the Airport at the Domestic and International Terminals. Exhibit 4.23 shows the International Terminal Rail Station on the Sydney Airport Link.

Exhibit 4.23 Sydney Airport International Terminal Rail Station



Source: Maunsell of Australia, 2005

The rail link was implemented at a cost of A\$800million and was Australia's first hybrid build-own-operate-transfer project and was opened in May 2000 prior to the Sydney Olympics. Equity participants are Transfield and Bouygues S.A. (50/50) who via a Joint Venture constructed the tunnel, laid the track and built the infrastructure. The Airport Link Company owns and operates four new stations along the link. The Debt Participants are the National Australia Bank. The New South Wales Government shared the cost and risk of the development.

Sydney Kingsford Smith Airport is the largest and busiest in Australia with all ground access being via the road network prior to the implementation of this link.

Issues/Results: When announced in 1990 Transport Minister Baird claimed, "the airport link will not require one cent of Government money." On November 30, 2000, the Airport Link Corporation was placed in the hands of the receivers at KPMG. The New South Wales Government according to one estimation "had to bail out the project, costing taxpayers A\$704M" (PPP's in South Australia: Partnerships, privatization and the public interest – John Spoehr, Evatt Foundation, September 2002). This was blamed on grossly overestimated ridership projections – forecasts were 48,000 passengers per day but in reality only 12,000 per day. Actual patronage may also have been affected by the use of the Eastern Distributor (another PPP), which runs parallel to the Airport Link rail line.

BRISBANE AIRPORT RAIL LINK

Brisbane, Queensland, Australia

The Brisbane Airport Rail Link is an A\$223M, 5.3-mile project servicing the Domestic and International Terminals at Brisbane Airport, developed as a build-own-operate-transfer PPP. It commenced operations in May 2001. Exhibit 4.24 shows one of the stations on the Brisbane Airtrain Rail Link.

Exhibit 4.24 Brisbane Airtrain Rail Link Station



Source: Maunsell of Australia, 2005

It is planned that the project will be turned over to the Queensland Government after five years of operation, though the company has a 35-year operating concession. Contractual arrangements require that the state government take control if Airtrain fails.

The rail link is owned and operated by Airtrain CityLink Pty Ltd. Equity Participants include:

- Transfield (50%);
- EGIS (10%);
- Hyder (15%); and
- Macquarie Bank and ABN AMRO serving as the debt participants (25%).

Issues/Results: The rail link is not performing as expected as ridership has been much lower than forecast. In March 2003, Moody's Investors Service sharply downgraded their rating for Airtrain Citylink Ltd., reducing it to Caa1 from B2 and saying the debt outlook is negative.

5. GLOBAL TRANSPORTATION PPP EXPERIENCE

This chapter provides a summary of transportation project PPPs around the world during the past two decades and available information on the current activity in selected countries not covered in earlier chapters of this report. The information contained in this chapter demonstrates the wide-ranging application of PPPs to the financing and delivery of transportation infrastructure projects in many parts of the world. Given the absence of dedicated funding sources such as the Transportation Trust Fund in the United States, many of these countries faced the fiscal and resource challenges to providing for the accessibility needs of their growing economies and populations. Major changes in the economic strength and relationships among nations have prompted these nations to seek alternative ways to expedite the development of transportation infrastructure to improve regional accessibility and support their economic growth. Examples of this include:

- Creation of the European Union;
- Breakup of the Soviet Union;
- Reunification of eastern European nations with their western counterparts; and
- Emergence of both China and India as major players in the global economy.

The evolution of PPPs to rapidly meet these emerging needs has led to their refinement and proliferation in type and number, with many more countries moving to establish the legal authority to enter into PPPs to expedite financing and delivery of surface transportation projects prompted by the changes noted above.

HISTORICAL SUMMARY OF GLOBAL ROAD-RELATED PPP ACTIVITY

The use of public-private partnerships to develop transportation infrastructure is more widespread in other parts of the world than in the United States. Exhibit 5.1 shows the dollar value of road, bridge, and tunnel projects funded and/or delivered as PPPs between the years 1985 and 2004 for each major region of the world.

Exhibit 5.1 Number and Value of Road-Related PPPs by Global Region¹⁸

Region	Total Planned & Funded Since 1985				Total Funded & Completed by 10/04			
	#	%	\$Billion	%	#	%	\$Billion	%
Africa	14	2%	\$4.8	1%	7	2%	\$3.7	2%
Asia	137	21%	\$83.9	26%	72	20%	\$44.5	28%
Europe	205	31%	\$139.1	43%	91	25%	\$58.1	37%
Latin America	126	19%	\$26.2	8%	83	23%	\$18.9	12%
North America	174	27%	\$70.8	22%	106	30%	\$32.2	20%
Total	656	100%	\$324.7	100%	359	100%	\$157.3	100%

¹⁸ AECOM Consult, Inc. "Synthesis of Public-Private Partnership Projects for Roads, Bridges & Tunnels from Around the World – 1985-2004", prepared at the request of the Federal Highway Administration, August 30, 2005. Derived from Exhibit 4 on page 8.

Exhibit 5.2 on the following page shows the further breakdown of road, bridge, and tunnel projects by global region according to type of PPP contract used to deliver the project. As indicated by this exhibit, the regions investing the most in PPP contracts to deliver road, bridge, and tunnel projects include:

- Europe
- Asia & Far East

Exhibit 5.2 also shows that the majority of PPP projects in other regions of the world use the following delivery approaches:

- Concession
- Build-Operate-Transfer (BOT)
- Build-Transfer-Operate (BTO)

Global statistics from the last two decades are described below regarding the use of PPPs to develop and finance the following types of road-related infrastructure¹⁹:

- Non-toll highway;
- Toll highway;
- Toll bridge;
- Toll tunnel; and
- Toll bridge/tunnel.

Non-Toll Highway Projects

- Most non-toll highway projects involving PPP arrangements for financing or delivery have been in Europe, predominantly in England, Spain, and Portugal. Many of these projects were financed by shadow tolls and involve either a DBFO or DBOM contract with terms of generally 30 years. Project costs have averaged \$400 million.
- Shadow tolling appears to be declining in Europe as a basis for highway project funding, especially in Portugal and England.
- Other non-toll highway projects have been in Canada, many of which have been DB and DBFO (most involving shadow tolls of 20-30 years duration) contracts.

Toll Highway Projects

- Most toll highway projects in Europe have occurred in Spain, France, Italy, Greece, and Ireland. These have been mostly Concession and BOT/BTO contracts averaging 30 years in duration. England has only recently begun to build toll motorways, having used primarily shadow tolling for highway financing in the past. Project costs have averaged \$680 million in Europe. Emerging Eastern European countries pursuing PPPs for toll highway projects include Poland and the Czech Republic.

¹⁹ AECOM Consult, Inc. "Synthesis of Public-Private Partnership Projects for Roads, Bridges & Tunnels from Around the World – 1985-2004", prepared at the request of the Federal Highway Administration, August 30, 2005. pp. 21-29.

Exhibit 5.2 Road, Bridge, and Tunnel Projects Planned or Completed by Global Region and PPP Contract Type – 1985 through 2004²⁰

Region	Contract Type	Number	Percent	\$ Billion	Percent	\$/Project
Africa & Middle East	Concession	1	8%	\$0.0	1%	\$0.039
	DBFO	3	25%	\$1.6	33%	\$0.527
	DBOM	2	17%	\$1.5	32%	\$0.761
	BOT/BTO	5	42%	\$1.5	31%	\$0.301
	BOO	1	8%	\$0.2	3%	\$0.150
	DB	0	0%	\$0.0	0%	N/A
	Mgt Contract	0	0%	\$0.0	0%	N/A
	Subtotal	12	100%	\$4.8	100%	\$0.400
Asia & Far East	Concession	49	40%	\$21.8	26%	\$0.444
	DBFO	5	4%	\$9.8	12%	\$1.956
	DBOM	2	2%	\$0.2	0%	\$0.078
	BOT/BTO	61	50%	\$34.9	42%	\$0.572
	BOO	1	1%	\$0.1	0%	\$0.143
	DB	4	3%	\$15.8	19%	\$3.946
	Mgt Contract	0	0%	\$0.0	0%	N/A
	Subtotal	122	100%	\$82.5	100%	\$0.677
Europe	Concession	69	34%	\$61.7	45%	\$0.894
	DBFO	45	22%	\$18.3	13%	\$0.407
	DBOM	26	13%	\$14.6	11%	\$0.563
	BOT/BTO	53	26%	\$31.4	23%	\$0.592
	BOO	1	0%	\$0.9	1%	\$0.936
	DB	4	2%	\$10.6	8%	\$2.648
	Mgt Contract	3	1%	\$0.9	1%	\$0.312
	Subtotal	201	100%	\$138.4	100%	\$0.689
Latin America & Caribbean	Concession	45	44%	\$11.6	44%	\$0.257
	DBFO	3	3%	\$0.7	3%	\$0.234
	DBOM	5	5%	\$1.7	7%	\$0.346
	BOT/BTO	50	49%	\$12.4	47%	\$0.248
	BOO	0	0%	\$0.0	0%	N/A
	DB	0	0%	\$0.0	0%	N/A
	Mgt Contract	0	0%	\$0.0	0%	N/A
	Subtotal	103	100%	\$26.4	100%	\$0.256
North America	Concession	81	50%	\$29.1	41%	\$0.359
	DBFO	5	3%	\$1.1	2%	\$0.228
	DBOM	14	9%	\$17.6	25%	\$1.259
	BOT/BTO	14	9%	\$4.3	6%	\$0.305
	BOO	5	3%	\$0.7	1%	\$0.137
	DB	33	20%	\$16.8	24%	\$0.510
	Mgt Contract	9	6%	\$0.6	1%	\$0.066
	Subtotal	161	100%	\$70.2	100%	\$0.436
Worldwide	Concession	245	41%	\$124.2	39%	\$0.507
	DBFO	61	10%	\$31.5	10%	\$0.516
	DBOM	49	8%	\$35.7	11%	\$0.728
	BOT/BTO	183	31%	\$84.4	26%	\$0.461
	BOO	8	1%	\$1.9	1%	\$0.239
	DB	41	7%	\$43.2	13%	\$1.054
	Mgt Contract	12	2%	\$1.5	0%	\$0.127
	Total	599	100%	\$322.4	100%	\$0.538

²⁰ AECOM Consult, Inc. "Synthesis of Public-Private Partnership Projects for Roads, Bridges & Tunnels from Around the World – 1985-2004", prepared at the request of the Federal Highway Administration, August 30, 2005. Exhibit 13 on page 20.

- Most of the toll highway projects in Asia & Far East have been located in China, Malaysia, Japan, South Korea, Australia, and India. These have been mostly BOT/BTO contracts averaging 30 years in duration. There have been several Joint Development Agreement (JDA) projects in China. Project costs have averaged about \$645 million in Asia & Far East.
- Most of the toll highway projects in Latin America & Caribbean have been located in Brazil, Chile, Columbia, Mexico, Peru, and Argentina. These have been mostly Concession and BOT/BTO contracts averaging 25-30 years in duration. Project costs have averaged about \$260 million in Latin America & Caribbean.
- The few toll highway projects in Africa & Middle East have been spread across various contract types, excluding DB and Contract Management. Most involve 30-year durations. Project costs have averaged about \$475 million in Africa & Middle East. South Africa is an active new entrant to the use of PPPs for surface transportation facility delivery.

Toll Bridge Projects

- Most of the toll bridge projects in Europe have been located in England, Germany, and Ireland. These have been mostly BOT/BTO contracts averaging 30 years in duration. Project costs have averaged about \$745 million in Europe.
- Most of the toll bridge projects in Asia & Far East have been located in China and South Korea. These have been mostly Concession and BOT/BTO contracts averaging 30 years in duration. There have been several Joint Development Agreement (JDA) projects and Asset Sale projects in China. Project costs have averaged about \$395 million in Asia & Far East. A more recent entrant to the use of PPPs for developing toll bridges includes India.
- There have been several toll bridge projects in Latin America & Caribbean, mostly located in Brazil and Argentina. These have been BOT/BTO contracts averaging 30 years in duration. Project costs have averaged about \$230 million in Latin America & Caribbean.
- Among the few toll bridge projects in Africa & Middle East, most have involved BOT/BTO and BOO contracts of 30-year average duration. Project costs have averaged \$125 million in Africa & Middle East.

Toll Tunnel Projects

- Toll tunnel projects have been spread across Europe, with the largest number located in Germany and the largest tunnels between England and France and in Switzerland. These have mostly been Concession, DBOM, and BOT/BTO contracts ranging from 27 to 99 years in duration. Project costs have averaged \$1.5 billion in Europe, with the Concession projects significantly larger on average than the DBOM or BOT/BTO projects.
- Most of the toll tunnel projects in Asia & Far East have been located in Hong Kong and Australia. These have mostly been BOT/BTO contracts averaging 30 years in duration. Project costs have averaged about \$450 million in Asia & Far East.

- There have been two toll tunnel projects in Latin America & Caribbean. These have been DBFO and BOT/BTO contracts ranging from 23 to 30 years in duration. Project costs have averaged about \$120 million in Latin America & Caribbean.

Toll Bridge & Tunnel Projects

- Europe has had one large toll bridge & tunnel project between Denmark and Sweden, delivered as a DB contract worth \$2.7 billion.
- There have been two toll bridge & tunnel projects in Asia & Far East delivered as Concession and DB contracts, ranging from \$100 million to \$14.4 billion.
- There have been two toll bridge & tunnel projects in Latin America & Caribbean delivered as Concession and DBFO contracts in Chile, ranging from \$70 million to \$400 million.

GLOBAL OVERVIEW OF CURRENT ROAD-RELATED PPP ACTIVITY BY REGION

The delivery of surface transportation infrastructure facilities by PPP is a worldwide development, driven by the demands of a growing global economy and the events such as:

- Establishment of the European Common Market;
- Creation of the European Union;
- Establishment of the South American Common Market;
- Rapid economic expansion of the economies in China and India; and
- Emergence of such nations as South Africa and Vietnam.

The collapse of the Soviet Union in the late 1980s spawned numerous sovereign nations in Central and Eastern Europe seeking membership in the European Union. This second wave of countries seeking to join an expanded European Union has spurred increased interest in PPPs as a means to expedite the upgrading and expansion of surface transportation infrastructure needed to knit the logistics fabric of Central and Eastern Europe with the more developed and prosperous Western Europe. Among the Western European nations, those countries with the most highway miles delivered and operated by private concessionaire companies include Italy, Spain, Portugal, France, and England. In contrast, Greece, Austria, and Norway have only public concessionaire companies²¹

Transportation infrastructure is widely recognized as a major prerequisite for economic expansion, especially in the case of developing countries. A major impetus for the use of PPPs to deliver transportation infrastructure in developing and under-developed nations has been the various international financial institutions, such as the World Bank and Inter-American Development Bank, the European Investment Bank (EIB), and the European Bank for Reconstruction & Development (EBRD).

The following vignettes discuss in varying detail the use of PPPs to finance and/or develop transportation infrastructure in various countries grouped by region. In addition to describing the transportation PPP activity by selected countries around the world, the following pages also

²¹ Fayard, Alain, *Private Sector Participation for Highways in the EU Legal Framework*. French Road Department, Paris, France. Presented at the Transportation Forum 2005, sponsored by the World Bank, Washington, D.C., March 2005.

discuss whether legislative changes were required to enable government agencies to engage in PPPs to overcome the fiscal impediments to developing transportation infrastructure.²²

Western European Countries

- **Italy**

- Long history of PPPs to finance and expedite surface transportation projects the government could not afford.
- Changes in legal framework in 2002 prompted further development of PPP approached to project financing and development for surface transportation infrastructure.
- National and regional governments in Italy have set up several companies whose focus is to promote and develop financing for large infrastructure projects.
- Most financing for Italian infrastructure PPPs has come from banks to mitigate the risks of delays between concession award and financial close, as well as delays in executing operation contracts.
- PPPs in Italy contain variable payment terms, which make payments contingent on project performance, although this is mitigated by including a fixed payment portion not subject to unavailability or performance deductions.

- **Spain**

- Long history of PPPs for surface transportation projects, mainly in for toll roads in the form of concessions since the mid-1990s.
- New concessions legislation in 2003 expanded use of PPPs to other infrastructure sectors.
- Early PPPs in Spain relied on bank loans but have since been converted to the capital markets offering lower-cost 30-year or longer terms.
- Spain has a 15-year (2005-2020) road improvement and network integration plan valued at €65B which is predicated on higher levels of private participation (25 percent) than in the past.

- **Portugal**

- In 1996, Portugal initiated a PPP program for highway development that consisted of seven shadow toll and seven real toll roads, of which a total of 10 concessions were awarded. One of the largest projects was the Second Tagus Crossing Bridge, which involved a 33-year DBFO concession that included operation of the original bridge across the Tagus River near Lisbon.
- New PPP legislation in 2003 required all new PPPs to transfer more project risk to the private sector partners and demonstrate value for money.
- Portugal's government has vacillated between the use of shadow tolls and user-paid tolls to fund its PPP concessions program for highway development. Recent efforts

²² Largely drawn from: *Global Survey of PPPs: New Legislation Sets Context for Growth*, Ratings Direct Research, published by Standard & Poor's, April 14, 2005 and other recent articles on PPP use overseas.

to move towards user-paid tolling for its PPP concessions slowed when concerns were raised regarding the credit implications of such a move on existing shadow toll-financed highways. In the end a mixed approach emerged, which authorizes the government-established public company that serves as the road national authority for road infrastructure in Portugal to determine whether a road concession will be paid by government-based shadow tolls or direct user-paid tolls.

- The planned highway to link the Portuguese capital Lisbon and the major city of Porto is an example of a PPP concession project that moved from shadow tolls to direct user-paid tolls. This project is scheduled for completion in 2008.
- Portugal's road PPPs are typically structured using the design-build-finance-operate (DBFO) model.

- **France**

- In the past, major new highway facilities were developed as toll roads by quasi-governmental entities which financed, developed, operated, and maintained the toll roads linking major urban areas of the country.
- Certain restrictions and public skepticism over PPP delivery of infrastructure projects somewhat curtailed further application of PPPs in subsequent years.
- In 2004, legislation passed which allows for private concession teams to use the DBFO PPP model to develop highways, with the contractor paid over time by the sponsoring public agency out of toll proceeds according to a pre-determined schedule.
- In 2006, these mature, quasi-governmental run toll highways were auctioned off to the highest-bidding concessionaires, providing a significant financial windfall for the country and the opportunity to use the proceeds to fund needed expansions and extensions to the nation's highway system within the context of a more integrated European Union.

- **Germany**

- The major PPP initiative in Germany has been the Toll Collect project, which is an automated toll collection system developed specifically for this project. The Toll Collect system is aimed solely at heavy trucks (HGV) over 12 tons which use the highways in Germany. Prior to Toll Collect, many of these trucks originated outside the country (especially from Central and Eastern Europe) and could avoid paying to use the nation's highways by not buying fuel in Germany.

The development of this project involved a number of major companies from Germany and France that took major development risks in committing to a fixed delivery schedule despite the innovative nature of the project, in which new technologies had to be developed and successfully integrated before the system was able to go on-line. However after the initial problems with the system were corrected by the reconstituted development team, Toll Collect has itself become a highly successful PPP which will foster other surface transportation project PPPs through the additional revenues it is expected to generate..

- One PPP approach for developing new road infrastructure in Germany is the F-Model for new road construction. Two tunnels projects have used the F-Model with mixed results.
- Another PPP approach used in Germany is the A-Model, intended for road widening projects. These projects are intended to be funded from the proceeds for the Toll Collect project, whose two-year delayed opening in 2005 temporarily stalled use of the PPP A-Model. The pilot project for the A-Model approach is the A8 highway, between Ulm and Munich, whose construction was initiated in 2006. The 30-year PPP concession includes building and operating the facility, with payment to the concessionaire to be derived from tolls collected through the Toll Collect system from heavy trucks using the route.
- In 2005, the government announced five highway expansion projects would be done as PPPs using the A-Model, with the private sector concession teams responsible for financing, expanding, and operating the facilities. These projects will be paid for out of the proceeds from Toll Collect imposed on all trucks using the expanded highways. The government provides start-up financing to compensate the concession teams for the use of the expanded highways by automobiles and light trucks which are not tolled.
- **Greece**
 - The Greek government has an active PPP program for financing and delivering transportation infrastructure, including major highways and bridges. A significant example is the Rhion Antirrhion Bridge, a major cable-stayed bridge that links the Peloponnese to the Greek mainland across the western end of the Gulf of Corinth, near Patras. Project stakeholders included the concessionaire, lending banks, and the Greek Government. The bridge opened to traffic in 2004 after a 5-year construction period.
- **Netherlands**
 - The Netherlands has limited PPP program for highway projects, with the first road PPP project contracted in 2003 for €218 million. This project involved the reconstruction of the PPS-A59 highway using a design-build-finance-maintain (DBFM) contract, which accelerated the project by four years and saved 14 percent from the original cost estimate. The reconstruction phase ending in December 2005 followed by a 15-year maintenance term that will end in 2020.
 - More recent PPP initiatives include a tunnel and two more highway projects.
- **Ireland**
 - Ireland has an active PPP Roads program which began in the late 1990s under the Irish National Roads Authority. Representative projects include a section of the N4/N6 Motorway between Dublin and Sligo/Galway which involves a 30-year concession for construction and operation of the highway extension between Kinnegad and Kilcock.
 - Another PPP DBFO concession contract is being used to upgrade and expand the M50 Orbital Motorway (ring road) to the west of Dublin, including upgrading the Westlink toll plaza to a fully electronic free flow toll facility.

- **Norway**

- In the last several years, Norway began to use PPPs for expediting infrastructure development when it's Parliament (Stortinget) authorized three pilot road projects, the first of which is the E 39 highway between Kielt and Bardshaug. The second of the pilot PPP projects will link Grimstad and Kristians, while the third project will link Lyngdal and Flekkefjord. International firms with PPP experience have teamed with Norwegian contractors to pursue these projects.
- Norway's PPP pilot road program is aimed at helping to create a highway network that unites the country, provides improved accessibility and safety, and is sensitive to the environment.
- Norway's pilot PPP road program does not include direct tolling as a mechanism for funding the projects. Instead a variety of other funding sources are being used to fund and finance the projects on a case-by-case basis.
- The lack of tolling in Norway's PPP road pilot program is in contrast to the country's urban cordon toll ring program which charges vehicles a fee (toll) to enter an urbanized area defined by a cordon ring of tolling stations at highway and arterial points of entry. The program is designed to reduce congestion in dense urban areas through road access pricing while raising revenues to help fund highway and transit capacity improvements. The program currently operates in Cordon ring tolling began in Bergen and 1986 and is also operated in the capital city of Oslo and Trondheim.

- **Sweden**

- The ruling parties of the Swedish government generally oppose PPPs as a form of privatization coupled with private financing of infrastructure. In contrast, many municipalities in Sweden are interested in PPPs to expedite needed infrastructure projects they cannot currently afford to finance.
- PPPs could be done in Sweden under current legislation with adequate political support. One example where a public-public partnership was used to expedite a project was the Oresund Fixed Link, a multimodal tunnel and bridge that connects the Danish Capital of Copenhagen and the Swedish City of Malmö. The project was publicly financed, with development and operation handled by a joint-venture company owned by Sweden and Denmark. Opened in 2000, results of this project initially did not meet expectations in terms of projected traffic and revenue, due in part to cost of the tolls. However major traffic increases occurred in 2005 and 2006 as Danish citizens purchased homes in Malmö where they are much lower in cost and use the Oresund Fixed Link to commute to/from jobs in Copenhagen.
- Like its neighboring Scandinavian country of Norway, the prior Swedish national government allowed a demonstration PPP project to introduce cordon area tolling in the capital city of Stockholm in 2006. Although originally opposed by the residents of Stockholm and its surrounding suburban communities, the six-month demonstration project received sufficient popular support in a September 2006 referendum to warrant continuation.
- Continued commitment to the cordon are tolling project in Stockholm by the national government is uncertain since the composition of the Swedish legislature changed

during the last elections and the party that campaigned against tolling and cordon area pricing that would support PPPs is now in charge.

- **Denmark**

- Like its neighbor to the north, Denmark is a sensitive topic for financing and delivering infrastructure projects. To address the concerns over what is perceived as a subtle form of outright privatization of the nation’s infrastructure assets, the Danish government has developed the “Denmark Model” in which several public sector agencies combine to form a joint venture to deliver infrastructure projects using public financing.
- Denmark Model has been used to develop several mega projects which posed huge project and financial risks, even if the private sector could have bid on the projects as PPPs. Both projects provide multimodal links between Denmark and its neighboring countries by crossing wide bodies of water which have traditionally separated these land masses and been served only by ferry boats.
- The two public-public-partnership projects include the huge Store Belt Crossing (Great Belt Crossing) between the Danish islands of Zealand and Funen across the Great Belt, which opened to passenger rail traffic in 1997 and auto traffic in 1998, and the Oresund Crossing described above. Both projects toll automobiles and passenger trains, although the Danish Railways provided an up front payment for the Great Belt Crossing to help fund the early development costs of the project. For each project, the private sector role is focused on project design, construction, and inspection.
- A third mega-project, called the Fehmarn Sund, would have linked East Denmark with Germany and provided a direct highway and rail connection between Hamburg and Copenhagen. This project has been stalled for a number of reasons, including:
 - § Differences between the two sponsoring nations regard how to finance the project, with Denmark preferring the Danish Model of public joint venture funding and Germany preferring a government guarantee of private financing;
 - § Uncertain financial feasibility of the project;
 - § Strong opposition by environmental and local community groups on the German side of the project; and
 - § Concerns over lost jobs associated with the ferry services now crossing the Fehmarn Sund.

These considerations ultimately led both nations to back away from the project, for now. However, both nations have expressed the desire to begin the project by 2010 and open it by 2015.

- **Finland**

- Traditionally Finland used the design-bid-build approach to project delivery, but over the past five to ten years has increasingly used the design-build and other PPP project delivery approaches based on legislation that permits the use of PPPs to finance and develop infrastructure projects.

- In 1995, the Finnish government awarded its first long-term PPP contract for the extension of the M4 highway from the city of Lahti and Järvenpää. The PPP concession contract called for the private consortium to finance, construct, and operate the roadway over a period of fifteen years. The motorway was delivered five years sooner than by using conventional project contracting approaches.
- Ten years later in 2005, the Finnish government sponsored another long-term PPP concession contract for extending the E18 Motorway from Turku to Helsinki in southwest Finland. The E18 Motorway is an important part of the Trans-European Transport Network, otherwise known as the “Nordic Triangle.” The Nordic Triangle links the Scandinavian capital cities to each other, from Oslo-Stockholm-Helsinki to the Russian border, and improves access to Central Europe. E18 is the busiest east-west corridor in Finland, carrying 60 percent of all international traffic in the country. The concession team is responsible for the design, financing, construction, and maintenance of the E18 extension (referred to as the Muurla-Lohja road project) over a contract term of 24 years. This is the first PPP roadway project in Finland to receive funding from the European Investment Bank (EIB), one of the largest European financiers of PPPs over the past 16 years. This reflects the increasing maturity of the PPP infrastructure market in Finland.
- The Ministry of Transport expects to use PPPs more in the future for both road and railroad infrastructure development projects to expedite their delivery schedules and reduce risks and costs to the state. Possible future projects include Main Road 6 and the Lahti-Luumäki railway.

Central and Eastern European Countries

- **Russia**

- The government has approved up to 20 toll roads, each involving private investor financing for half of the project cost.

- **Poland**

- Numerous road infrastructure facilities are being developed using PPP concession-type agreements to expedite project financing and delivery. This includes the A4 Tolloed Motorway, which links Krakow to the Polish-German border. The last section of A4 was recently constructed and is now being operated and maintained using a PPP concession arrangement.

- **Hungary**

- The state-owned company responsible for road maintenance and operations (toll collection) can compete or partner with private sector companies for road construction projects.
- PPP projects include several highways, including the M6 highway concession, the refinancing of the first phase of the M5 highway (initially completed in 1998) in 2004, and the financing of the second phase extension of the M5 highway (completed in 2005). The M5 highway links the capital city of Budapest to the border with Serbia.

- The M1/M15 toll Motorway links the Hungarian Capital of Budapest with Vienna and Bratislava and was developed in the late 1990s as a PPP project which involved private and World Bank financing. The facility achieved only 40 percent of its projected traffic and revenues and required subsequent refinancing. This could be attributed in part to the difficulty in estimating travel behavior in an eastern block country when first exposed to road tolling.
- **Slovakia**
 - A recent feasibility study identified eight highway projects for development as PPPs, using the DBFO model.
- **Czech Republic**
 - New legislation has amended public procurement laws to enable infrastructure development through PPPs.
 - Prague is considering using PPP financing and delivery for its proposed ring road around the city.
- **Bulgaria**
 - A national “fast-track” infrastructure development plan focuses on PPPs using the concession approach to integrate the nation’s railroad network with the rest of Europe’s rail system.
- **Croatia**
 - Over 928 kilometers of highways in Croatia are operated by four companies, 90 percent of which are tolled. One public company is responsible for 68 percent of the tolled highways and 92 percent of the non-tolled highways in Croatia. Two private concessionary companies only operate tolled highways, representing a combined 28 percent of Croatia’s tolled highways. The third private concessionary company is responsible from the smallest portions of the tolled (four percent) and non-tolled (eight percent).highway network
 - The public road construction and operating company and several of the concessionary companies are progressing on several road projects involving the improvement and expansion of the A2 toll highway between the border with Slovenia and the City of Krapina. The initial section of A2(Zagreb to Krapina) was built by the public company and opened in 2001. The second section of A2 (Zagreb to Macelj) was built by one of the concessionary companies and opened in 2005. The third and final section of A2 (Slovenia border to Krapina) was built by another of the concessionary companies and opened to traffic in 2006. Overall the toll highway traffic volumes, revenues, and cost savings for the A2 toll highway have exceeded projections.
 - Most highway construction in Croatia is funded by toll revenues and financed by loans. Only the private road company has access to revenues from the country’s fuel tax. By 2013, Croatia expects to have a highway network totaling 1,365 kilometers. This represents an increase of 635 kilometers or 87 percent in ten years. Most of this growth will come in the form of tolled highways, with opportunities for development using some form of PPP concession arrangement.

- **Romania**
 - A change in the national government has put in question whether certain PPP contracts already awarded would continue or might be cancelled. This demonstrates the nature of political risk facing private partners in PPPs in countries where a change in government may result in changes in policies and potential cancellation of prior contractual commitments.

Asia and Far East Countries

- **China**
 - China has a long history of PPP investment in infrastructure projects due to the need for foreign investment to support its economic expansion plans.
 - The burgeoning economy of China has required massive infusions of foreign capital and know-how for developing roadway and other kinds of surfaced transportation infrastructure.
- **India**
 - The fast-growing economy and modernization of India has required the use of PPPs to finance and develop much of the nation's plan to develop 13,000 kilometers of roadway.
- **Japan**
 - PPPs are a recent phenomenon in Japan for financing and developing infrastructure projects, made possible by enabling legislation.
 - PPPs have become a fast-growing approach to infrastructure delivery in Japan.

Latin and South American Countries

- **Mexico**
 - Toll road concession failures in the 1990s have given way to more conservative financial structures whereby the concession allows the concessionaire more time to develop the project and its traffic and revenue base before turning it back to the government sponsor.
 - More recent toll road PPPs involve experienced international toll road builders and operators who better understand which it takes to develop and deliver a successful PPP within the risk tolerance of the private sector partners.
 - Local debt markets with more patient capital have replaced local bank short-term financing for road PPP projects.
- **Chile**
 - Chile has one of the most extensive, integrated, and successful PPP programs for highway financing, development, and operation in South America, based on tolls for funding.
 - Recently Chile has awarded a PPP concession contract with a 30-year term for its longest bridge valued at €400 million.

- **Brazil**
 - PPPs are used for a wide variety of infrastructure types, including roads, railways, ports, and irrigation projects.
 - 23 PPP projects were initiated in 2005.

IMPLICATIONS

In many of the countries discussed above, the impetus for using a variety of PPP approaches to expedite delivery of needed transportation facilities comes from the changing conditions and opportunities resulting from global shifts in political and economic alliances and the interdependency required by an ever-expanding global economy. As listed earlier in this section, these changes include the growing economic activity in nations that were formerly part of the Soviet Union, coupled with the emergence of economic trading blocks such as the European Union and the South American Union. Ultimately it is the continued expansion of the interdependent global economy that is prompting many nations overseas to adopt strategies like PPPs to speed the delivery of transportation infrastructure needed to facilitate and respond to these developments.

6. RESULTS AND CONCLUSIONS

This chapter summarizes the key insights provided by the international transportation PPP project case studies and cameos presented in Chapters 3, 4, and 5 of this report. This includes issues that often confront sponsors and providers of PPP projects overseas and the strategies used to address and overcome these potential impediments. The chapter also contains summaries of the results and lessons learned from the PPP case studies and cameos. It provides conclusions regarding the advantages and challenges of using PPPs for surface transportation capital projects; recommendations to enhance the potential to use PPPs to achieve more cost-effective delivery of transportation projects and operating services, and closing remarks regarding the important role PPPs can play in expanding the surface transportation program in both developed and developing countries. The chapter concludes with remarks regarding the use of this report, a companion report on U.S. PPPs, and a PPP Guidebook by both practitioners and individuals or groups interested in the application of PPPs to help address the fiscal and resource crises facing the surface transportation community.

ISSUES AND STRATEGIES TO ADDRESS THEM

Based on the PPP transportation projects documented as case studies and cameos in Chapters 3, 4, and 5, Exhibits 6.1 through 6.5 provide summaries of the major issues and impediments faced by these projects and the strategies used to address them by sponsoring agencies overseas and their respective private sector partners. This information is organized into five categories:

- Legal
- Technological
- Funding and Finance
- Environmental
- Administrative

These issues and strategies illustrate how certain members of the PPP project teams (including both public and private partners) dealt with problems that arose during project development, financing, and implementation. In few cases were the partners unable to fully overcome the impediments they faced in applying the PPP approach to surface transportation project delivery. Even in these cases, the strategies suggest courses of action for resolving these issues in the future. These summaries are not intended to suggest the full spectrum of possible impediments that transportation PPPs might encounter or all possible ways to address them. However, they provide a sampling of what sponsoring agencies and provider teams might encounter in pursuing transportation project delivery as a PPP.

RESULTS OF INTERNATIONAL TRANSPORTATION PPP PROJECTS

The results of the transportation PPP projects from overseas presented as highway case studies or transit cameos are summarized in Exhibits 6.6 and 6.7, respectively.

Included in the case study and cameo results summaries are the following information for each project as available:

- PPP Contract Type
- Project Timeframe
- Project Cost
- Economic Development Consequences
- Other Pertinent Results

LESSONS FROM INTERNATIONAL TRANSPORTATION PPP PROJECTS

The key lessons from the transportation PPP projects described in this report from overseas are summarized in Exhibit 6.8. The lessons noted in the exhibit are instructive for any sponsor or provider actively involved in or considering participation in a transportation PPP project. Exhibit 6.9 summarizes the critical success factors for transportation PPPs based on the case studies and cameos presented in Chapters 3, 4, and 5.

CONCLUSIONS

Transportation agencies around the world face daunting fiscal challenges caused by the growing gap between the costs of preserving and expanding highway infrastructure and available highway program funding. The lack of dedicated public funding sources for transportation (in most other countries high motor fuel taxes are generally used non-transportation social programs) and the burdens placed on current transportation infrastructure (both highway and rail) by a growing global economy has long prompted transportation policymakers overseas, especially in Western Europe, to develop and apply alternative ways to finance and deliver needed transportation infrastructure. A number of countries have turned to the private sector for relief in the form of contractual public-private partnerships, representing a wide variety of project financing and delivery approaches to achieve the following outcomes:

- Lower project costs;
- Expedite project delivery;
- Expand access to capital markets;
- Implement new technologies; and
- More efficiently and effectively operate and maintain surface transportation assets and services.

The common element of a PPP is that the public sponsor of an infrastructure project engages the private sector to a greater degree in the performance of certain functions previously handled by the public sector to gain the benefits listed above. This can range from contracted maintenance services to full financing, development, operations, and preservation. Some countries have effectively turned over the responsibilities, risks, and rewards associated with performing these functions to private sector firms through long-term concessions or franchises, whose financing is supported by tolls, shadow tolls, or availability payments. PPP approaches to project financing and delivery have added another dimension and resource pool to the provision of transportation infrastructure and services in many countries, and the list of participating countries is rapidly

expanding as the international financial investment community has come to realize the opportunities associated with this expanding market for transportation infrastructure financing.

The use of public-private partnerships overseas to expedite surface transportation is likely to grow as national and local jurisdictions address the challenges of rehabilitating their aging and often outdated transportation assets while adding necessary facilities and expanding services to support growing economies and populations. This is being prompted in part by major changes in the economic and political structures in places like Central and Eastern Europe, Asia, and Latin America. The collapse of the Soviet Union and the formation of the European Union have spurred the need for better linkages between the emerging economies that make up the expanding global economy. The explosive economic growth of the economies in China and India, plus the developing economies in Latin America, contribute to a worldwide need for additional transportation capabilities which most growing nations need but lack the internal financial resources to provide.

In recent years legislative and project initiatives in a number of developed and developing countries seeking to use PPP approaches to expedite their transportation infrastructure programs have drawn on the experience of other nations which have instituted PPPs and refined their structures over the years since the late 1980s and early 1990s, such as England, France, Spain, and Italy.

The experience gained by various countries which have used PPPs to expedite transportation projects shows that the structure and delivery methods selected are highly dependent on the following features:

- Enabling statutes and regulations;
- Capabilities of all members of the partnership to execute their roles and responsibilities;
- Flexibility and a proactive approach to identifying and resolving issues that arise during the project planning and development process;
- Underlying taxation arrangements; and
- Ability of capital markets to deliver financing structured to suit each PPP project.

The various case studies and cameos presented in this report illustrate how these issues vary by project and need to be addressed on a case-by-case basis. Particularly important are potential political risks arising from the implementation of PPP arrangements for specific projects where the local or national economy or political environment is unstable. The case studies highlight both the challenges and opportunities of various PPP approaches and strategies used to address impediments that arose as the international PPP projects evolved within the context of national legal, regulatory, and institutional frameworks.

As demonstrated in certain of the case studies and cameos, increased involvement by the private sector may not by itself prevent a project from experiencing difficulties that result in higher costs and/or schedule delays. Various circumstances may cause projects to experience problems beyond the ability of the private development team to mitigate or eliminate. This is why a careful analysis of potential risk factors should be performed before a public sponsor and private delivery team enter into a PPP arrangement, particularly where there are significant externalities or complexities to the project.

Prospective partners to a PPP should consider the following in assessing whether to proceed with a PPP approach:

- While the involvement of the private sector in a transportation capital project and its operations can help improve the cost-effectiveness and timeliness of project delivery and provide other benefits in terms of risk transfer and access to financial markets, it is not a guarantee of successful delivery or financial self-sufficiency.
- While the involvement of the private sector can enhance the prospects for a good project to be successfully delivered within budget and schedule limitations, greater involvement by the private sector may not make a project of dubious feasibility automatically become feasible.
- PPPs are not a strategy for turning bad projects into viable projects just because the private sector is involved to a greater extent, except in those cases where the private sector can gain significant value capture benefits that lower the public sponsor's responsibilities for project capital and O&M costs.
- The private sector is subject to ridership, development, and revenue risks since projections of material prices, ridership, revenues, and development activity are subject to future events or changing conditions that could affect these estimates and the assumptions upon which they are based that are beyond the control of either the private or public sectors.
- The private sector is capable of misjudging the feasibility of transportation infrastructure projects given the many factors that can influence the success or failure of a project to fulfill its contractual obligations in a cost-effective and timely manner. However, the private sector has greater incentive and due diligence techniques for minimizing the potential for these kinds of problems, particularly when it has an equity position in project financing which is at risk if the project does not achieve certain performance requirements.

A review of the available literature indicates that the number of successful PPP transportation projects is much larger than the number of projects involving the private sector which have experienced difficulties, typically for reasons not related to the increased involvement by the private sector. In many cases the involvement by private sector partners reduced the extent and consequences of these difficulties.

With many PPP approaches available, the kind of private sector involvement can vary by function, service, project, and agency. Some partnership approaches may not be appropriate or beneficial in certain cases while in other instances a PPP can turn a troubled project into a success. The essence of a PPP is that it is based on a true partnership, where both the public sponsor and private delivery team are involved in ways that maximize their contributions to the project based on their respective capabilities.

While not expected to fully overcome the fiscal, staffing, and technological shortages facing national and local transportation agencies, PPPs offer many potential advantages over more traditional approaches when conditions are conducive to successful project development, financing, and implementation involving the sharing of responsibilities, risks, and returns associated with transportation projects and services. The experiences and lessons learned from other countries with more experience than the United States in applying PPP approaches are intended to inform U.S. officials and transportation agencies about what others have done and are doing to develop and implement successful PPP projects and their results. Armed with this information, it is the purpose of this report to encourage consideration and broader application,

where appropriate, of PPP approaches to leverage scarce public resources and expedite financing and delivery of essential transportation projects in the United States

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Several companion reports were also prepared as part of this project. One report presents case studies and cameos of recent surface transportation PPP projects from the United States. Another report serves as a guidebook for individuals, agencies, and companies interested in using PPP approaches to expedite transportation projects. The PPP Guidebook provides summary information regarding the background underlying the growing interest and use of PPPs for surface transportation projects, the various types of PPP approaches available, key impediments that face public agency sponsors and private delivery firms considering PPP approaches to deliver transportation infrastructure improvements, and various strategies to effectively address and overcome these impediments to a successful PPP project based on both domestic and international PPP projects.

These reports go beyond theoretical concepts to focus on pragmatic results of actual PPP projects. Each report draws significantly from the results of actual transportation PPP projects and the experiences of public and private partners involved in these projects. The products provide candid views of the challenges and opportunities that PPPs offer sponsors and deliverers of transportation infrastructure facilities and services.

Exhibit 6.1 Legal Issues and Strategies Used to Address Them for International Transportation PPP Projects

Issues	Strategies
Lack of legal authority to enter into a PPP to develop transportation infrastructure projects at the national level was widespread in many nations, particularly in developing nations and those countries formerly part of the Soviet Union	Introduce broad and flexible legislation that provides the legal basis for national or local transportation agencies to use PPPs as a way to expedite financing and delivery of transportation infrastructure and support services.
Overly restrictive covenants in concession agreement that limited the concessionaire's ability to adjust toll rates in a timely manner and to introduce alternative project delivery approaches, even if more cost-effective	<p>Incorporated more flexible language in the concession contract agreement to allow more flexibility for the concession team to adjust toll rates, apply alternative project development approaches, and introduce innovative technology over the terms of the contract, based on a shared risk-reward arrangement with the sponsoring government or public agency.</p> <p>Held the concession team accountable for service and condition performance standards through regular inspections and reviews. This was especially important to account for unanticipated changes in the underlying conditions that serve as the basis for the PPP agreement, such as technological innovation and obsolescence, major demographic and land use shifts, and changes in life styles that significantly influence travel behavior of the public and freight shippers.</p>
Burdensome requirements for majority participation by quasi-public company established by the government reduces flexibility and cost-effectiveness of the private sector members of the joint venture team and the potential value capture (reward) relative to the risks held by the private side of the JV	Eliminated requirement for majority PPP responsibilities being held by the government partner of concession teams through quasi-public infrastructure development companies set up by the government, which had reduced the attractiveness of the PPP project to qualified concessionary companies which would otherwise be interested in competing for the project.
Differences in legal authority for PPPs between sovereign nations in a region characterized by significant cross-border movements of people and goods creates the potential for incompatible PPP contracting and project delivery which may result in stalled projects that depend on several nations to agree on the nature of the project, its funding and financing approaches, and its timing relative to the respective capabilities of each nation and the relative benefits and costs each participating nation will accrue	Develop contract language that is compatible with the legal framework and authority of each participating nation for sponsoring and administering transportation PPPs for projects sponsored on a bi-lateral or multi-lateral basis. Efforts in the European Union to establish compatible legal and technological frameworks for infrastructure delivery and operation is a major step to achieving this on a regional basis, while still respecting the sovereign nature of each member nation.

Exhibit 6.2 Technological Issues and Strategies Used to Address Them for International Transportation PPP Projects

Issues	Strategies
<p>Challenges of setting fixed deadlines for project start-up that is dependent on new or to-be-developed technology, which posed high risks for the public sponsor and especially for the private provider team</p>	<p>Established a flexible delivery schedule in concert with all partners to the PPP, based on probabilities established regarding delivery of fully-operational technology so that contingency plans can be developed and implemented in case the technology is not ready when scheduled, which is more likely when relying on development and testing of new technologies.</p> <p>Build into implementation schedule of project scheduled service downtime to permit conversion and de-bugging of the new systems for PPP projects that are built under continuing transportation service.</p> <p>Use Design-Build-Operator (DBO) approach to PPP project for a specified period after the construction phase is completed (2 years minimum for operating systems) to ensure the operating service and control systems work properly without jeopardizing public safety.</p>
<p>Difficulty in handling expected high volume of traffic when the toll facility opened</p>	<p>Introduced electronic toll collection (ETC) technology to bridge, offering the toll transponder at no cost and providing a seven percent discount to ETC users. ETC usage has grown to 20 percent after 15 years of operation.</p>
<p>Lack of interoperability between tolling schemes in separate countries, especially adjacent countries which serve the same traffic, is a challenge for concessionaires competing to develop and operate toll facilities in different countries with different technical requirements</p>	<p>Despite the European Commission's directive to have all tolling systems in the European Union interoperable, Germany departed from the requirement with its own proprietary system for tolling heavy trucks. In response, efforts are being made to develop equipment that is compatible with each of the major tolling systems being used.</p>

Exhibit 6.3 Funding/Financial Issues and Strategies Used to Address Them for International Transportation PPP Projects

Issues	Strategies
Public opposition to toll highways stemming from historical examples of toll monopoly pricing and inconvenience of stopping to pay cash tolls	Instituted one of the early PPP projects as a DBFO, using shadow tolls instead of direct user tolling, to fund the project based on the availability and use of the facility without the challenge of countering the long-standing negative image or inconvenience of cash-based tolling.
	Shadow tolling expedited completion and opening of the project and promoted high quality operating and maintenance of the facility by the concession team, including prompt clearance of stalled or damaged vehicles and minimization of lane closures through scheduled preventive maintenance.
Financial risks of shadow tolling to both public and private partners	The private concession team assembled a portfolio of funding sources for the project, including member equity and numerous (32) bank loans (debt), which demonstrated the commitment of the joint venture concession team to the project and spread the financing risks of the project among a broad set of financial institutions.
	Available traffic data from nearby trunk highway facilities mitigated the uncertainty regarding the traffic and revenue projections developed for the project by the private PPP joint venture team.
	Project sponsor retained the ultimate funding risk of finding adequate public funds to pay the concession team the shadow tolls earned based on lane availability and traffic usage.
	Project sponsor reduced its financial risks of paying excessive shadow tolls by placing a limit on the level of shadow toll revenues that could be earned by the concession team if traffic volumes significantly exceeded projections.
Allocating financial risks among partners to PPP	Private provider team accepted greater risks for construction, revenue, and residual costs in return for the public sponsor agency agreeing to a non-compete clause applied to both highway and transit facilities near the proposed facility.
Allocation of windfall profits resulting from linkage to nearby roads	PPP arrangement provided for revenue sharing between public agency and facility owner-operator if transportation network improvements benefited the tolled facility in terms of added traffic and toll proceeds.

Exhibit 6.3 Funding/Financial Issues and Strategies Used to Address Them for International Transportation PPP Projects - continued

Issues	Strategies
<p>Traffic and revenue estimates not realized in early years of long-term concession</p>	<p>Three years into 54-year concession, the debt was restructured so that the debt service payments better matched the project cash flow, resulting in a significant savings to concession team (\$700 million).</p>
	<p>Concession team reinvested 30 percent of the refinancing gain to fund neighboring transportation expansion projects desired by sponsoring agency which lacked adequate internal funds to perform these projects in a timely manner.</p>
<p>Financial risk of large-scale project if using private funds</p>	<p>Using the DBFO project delivery approach, with funding provided from tolls, placed the project's financial risk on the private sector consortium that developed the bridge project.</p>
	<p>Major delay in project schedule when financial syndicate experienced difficulty raising the necessary financing solved by further diversifying the debt syndication structure and limiting debt financing to 90 percent of the project funding needs.</p>
	<p>Availability of extensive traffic and revenue data from nearby tolled facility (tunnel) reduced the financial risk to the private consortium that developed the bridge project.</p>
<p>Financial risk of including responsibility for existing facility as well as new facility developed by private consortium</p>	<p>The public sponsoring agency took responsibility for correcting the structural fatigue found on a parallel bridge that was included in the 30-year DBFO concession contract for developing a second crossing facility, since the problem was caused by the original design and maintenance of the original facility that long pre-dated the concession contract.</p>
	<p>As the first long-term DBFO concession contract of its kind for the sponsoring transportation agency, the private concession team should have performed a more careful inspection of the existing parallel facility to ensure there were no critical flaws that might become a costly contractor liability during the contract. This should have occurred before the PPP concession agreement was signed, especially since the agreement included responsibility for operating and maintaining both the older facility and the new facility to be built under a concession agreement spanning 30 years.</p>

Exhibit 6.3 Funding/Financial Issues and Strategies Used to Address Them for International Transportation PPP Projects - continued

Issues	Strategies
High public sponsor financial risks of early PPP projects	Initially the public sponsor assumed all traffic and revenue risks for transportation project PPPs by setting a minimum revenue guarantee for the private provider. This significantly reduced the financial risks to the private sector providers willing to participate in proposed transportation project PPPs.
	Public sponsor assumed financial risks due to inflationary impacts on project costs, financing costs, and potential default. The private consortium assumed only the design and construction risks. This resulted in lower risk premiums associated with the private provider bids for early transportation project PPPs in the program.
	Later transportation project PPPs required sharing of project risks associated with traffic and revenue estimates, financing costs, and default between the public and private members of the PPP.
	The public sponsor allowed the private concession team to retain ownership of the transportation facility developed through a PPP arrangement to enable the team to claim depreciation credits for tax-reporting purposes, thereby reducing the financial costs of the project to the sponsoring
	Governments at national and local levels provided tax concessions, and state funding to attract private financing for project and project-related infrastructure development such as approach roads and ramps. This also included exempting earning concession earning from taxes and on construction equipment purchased for the PPP project.
	Early PPP projects were small in size, with financing repaid from value capture of consequential economic development as the government took a very conservative approach to PPPs. Subsequent liberalization of the economy allowed significant increase in private sector participation, including up to 100 percent financing supported entirely by tolls.

Exhibit 6.3 Funding/Financial Issues and Strategies Used to Address Them for International Transportation PPP Projects - continued

Issues	Strategies
Allocating financial risks among partners to PPP	Private provider team accepted greater risks for construction, revenue, and residual costs in return for the public sponsor agency agreeing to a non-compete clause applied to both highway and transit facilities near the proposed facility.
	Public sponsor agency provided all right-of-way to a higher-risk project at no cost, as well as all necessary approach roads and bridges.
	Government assumed most traffic and revenue risks for greenfield project by agreeing to pay 80 percent of any deficit in actual revenues compared to projected revenues, while the private concession team agreed to provide 57 percent of the positive difference between actual and projected revenues.
	Concession agreement allowed the government to acquire up to a 49 percent interest in the project.
	Government mitigated traffic and revenue uncertainty and construction risks by committing half the funding for DBOM project.
Allocating construction risk among partners to PPP	Sponsoring agency expedited the PPP project by acquiring needed right-of-way and building two interchanges along the proposed highway alignment. Remaining construction risks were borne by the project delivery consortium.
	Sponsoring agency required to increase highway capacity whenever congestion exceeded certain levels due to growth in traffic volumes, with the facility expansion paid out of a government reserve fund, excess toll revenues, or equity payment from the consortium after reserve funds are exhausted.
Traffic and revenue risks	Presence of non-complete cause in the PPP contract made mute by presence of previously-built longer parallel toll-free roads which reduced somewhat traffic and revenues and hence profitability of the project.
	Varied toll rates to manage traffic and provide free-flow conditions to optimize throughput volume.

Exhibit 6.4 Environmental Issues and Strategies Used to Address Them for International Transportation PPP Projects

Issues	Strategies
<p>Widespread public opposition to project due to broad array of environmental and community concerns</p>	<p>Held regular meetings with local community groups during both construction and implementation phases to identify and mitigate construction-related impacts and operational impacts once opened.</p>
	<p>Negotiated agreement with major opposition groups that included conditions requested to be included in the concession agreement, such as the use of noise-reducing asphalt.</p>
	<p>Used comprehensive environmental studies prior to plan development that included extensive public outreach and stakeholder communications over a 4 to 8-year timeframe that resulted in adjustments to the original facility locations.</p>
	<p>Used public outreach during the environmental planning process to convert a planned toll project to a non-tolled facility paid through shadow tolls.</p>
	<p>Integrated new facility into the local geography, added landscaping, and built high embankments to hide toll plazas.</p>
	<p>Constructed by-pass routes for trucks accessing the construction site during project development.</p>
	<p>Integrated environmental mitigation and improvement mechanisms early in preliminary design process.</p>

**Exhibit 6.5 Administrative Issues and Strategies Used to Address Them
for International Transportation PPP Projects**

Issues	Strategies
Challenge of resolving disputes between public and private partners to a PPP	Held project team forums during both design and construction phases to discuss and resolve various administrative and other issues that could have impacted the project cost and schedule. These forums involved senior managers of the public sponsor agency and the private concession team.
	Held various technical forums to address and resolve more specialized (technical) issues, involving technical representatives of the public sponsor agency and the private concession team.
Quality, cost, schedule, and performance risks during concession term	Ensured that the concession team had a long-term commitment to the project and the technical capability and experience to perform the project consistent with the terms of the PPP contract.
	The public sponsor agency delegated technical quality approval (quality control) to the concession team to expedite the project schedule.
	Create a positive partnership relationship among all members of the PPP from the beginning of the contract and extending throughout the contract.
How to hold the concession team accountable for project performance according to the terms of the contract	Have the public sponsor agency require an annual report by the concession team describing the performance results relative to standards or targets contained in the contract, such as: traffic volume, traffic revenue, network improvements, maintenance results, emergency response, crashes, claims, equipment requirements, lane closures, and structural inspection results.
	Have the public sponsor agency use regular inspection, preventive treatments, and asset management to preserve the facility and minimize lane closures (down time) that could reduce traffic flow and limit shadow toll or regular toll revenues.

Exhibit 6.5 Administrative Issues and Strategies Used to Address Them for International Transportation PPP Projects - continued

Issues	Strategies
Start-up problems with facility operator unfamiliar with the implementation of new electronic toll collection technology	The public sponsor intervened to resolve technology implementation problems by conducting tests to ensure the electronic toll collection system properly functioned.
Challenge of attracting sufficient private sector interest in PPP to ensure a competitive procurement process	Numerous consortia expressed interest in the project as a result of several prior successful PPPs that were highly profitable for the concessionaires or operators.
Risk of entering a PPP relationship with an untried consortium	National and provincial government agencies established effective working relationships between project sponsors and private project providers, including both domestic and foreign investors, construction companies, and operators comprising the private sector portion of the PPP.
Risk of changing design standards during PPP development process	The public sponsor agency assumed responsibility for paying the costs resulting from project design standards that occurred during the 8-year in the project caused by organized environmental and community opposition to the project.

Exhibit 6.6 Key Results of Using PPPs to Deliver International Transportation Projects

PPP Project	PPP Type	Timeframe	Cost	Economic Development	Other
United Kingdom - M6 Toll Highway	54-year DBFO concession for first tolled highway built in England in many years	Delayed 8 years due to public opposition to tolls on highways	Project costs increased due to delays caused by community and environmental opposition	Economic development was not a factor due to recent completion of facility and limited traffic volume.	Auto traffic increased according to projections while truck traffic has significantly lagged expectations. Plans to expand the toll highway 50 miles were abandoned in 2006 due to high right-of-way costs, toll opposition, and lack of private sector interest given the performance of M6. Widening the highway to 6-8 lanes has also been delayed 8-10 years.
United Kingdom - Dartford Toll Bridge	First DBFO highway project undertaken in England	Completed on schedule	Completed within budget	Not available	Provided needed additional capacity to relieve congestion on existing tunnels linking the M-25 orbital road crossing the Dartford River. Volume of traffic provides the potential to retire the debt service on the construction costs of the bridge and rehabilitation of the adjacent tunnel within 20 years of completion.

Exhibit 6.6 Key Results of Using PPPs to Deliver International Transportation Projects - continue

PPP Project	PPP Type	Timeframe	Cost	Economic Development	Other
United Kingdom - Second Severn Bridge	DBFO concession for new bridge and O&M on the original bridge for up to 30 years, or until the debt service is retired by tolls on the two bridges	Completed on schedule	Completed new bridge within budget and repaid the outstanding debt on the original bridge	Not available	Relieved congestion on parallel original bridge while providing redundant capacity to accommodate traffic whenever lanes on either bridges are taken out of service for maintenance and major rehabilitation purposes. This became a necessity when the agency operating the original bridge found that the suspension cables had severely deteriorated and required replacement.
United Kingdom - M1-A1 Highway	Largest and most complex DBFO concession in national PPP program initiated in 1994 paid by public agency shadow tolls	Completed ahead of schedule, and many years ahead of the timeframe using traditional project delivery approaches	Completed within budget	Reduced congestion in area served by the highway which spurred economic development along the highway and the trunk highways it connected.	PPP arrangement expedited resolution of issues and enhanced coordination and communication among the members of the partnership. The new highway produced sufficient traffic to fully support the level of shadow tolls paid to the concession team by the highway agency to cover both debt service and operations and maintenance costs incurred by the concession team.

Exhibit 6.6 Key Results of Using PPPs to Deliver International Transportation Projects - continued

PPP Project	PPP Type	Timeframe	Cost	Economic Development	Other
Australia - Sydney Harbor Tunnel	BOOT, with minimum revenue guarantee	Completed on schedule	Completed within budget	Not available	Relieved congestion crossing Sydney Harbor, and also allowed addition of dedicated bus lane on the bridge.
Melbourne CityLink	BOOT concession for 34 years duration	Construction completed on schedule, but toll operations curtailed until start-up problems were corrected	Completed within budget	Project improved highway network capacity in central Melbourne, providing congestion relief in and around Melbourne. It also provided economic benefits to motor carriers through better traffic flow along the system.	First application of cashless open road tolling in Australia, based on electronic toll collection and photo recognition technologies.
Australia - Port of Brisbane Motorway	DB	Delivered 6 months ahead of schedule	Completed \$20 million under budget	Not available	Not available

Exhibit 6.6 Key Results of Using PPPs to Deliver International Transportation Projects - continued

PPP Project	PPP Type	Timeframe	Cost	Economic Development	Other
Australia - Eastern Distributor - Airport/M1 Highway	BOT	Not available	Completed within budget	Not available	Not available
Hong Kong - County Park Motorway	BOT non-tolled concession for 30 years	Completed on schedule	Completed within budget	This joint development project improved access to container port and airport facilities in the Northwest Territories and encouraged further economic development in the region.	Provided strategic highway linkage between Hong Kong and mainland China - one of several non-tolled highway, bridge, and tunnel PPP projects sponsored by the Hong Kong government prior to reunification with China.
Israel - Yitzhak Rabin Trans-Israel Highway	Finance-Design BOT Concession	Completed on schedule	Completed within budget	Project expanded highway capacity in the central spin of Israel, thereby relieving congestion along non-tolled parallel routes to the east and west of the tolled highway.	The highway is Israel's first tollway and uses cashless open road tolling, based on electronic toll collection and photo recognition technologies. Traffic and revenues have grown faster than forecasted prior to construction.

Exhibit 6.6 Key Results of Using PPPs to Deliver International Transportation Projects - continued

PPP Project	PPP Type	Timeframe	Cost	Economic Development	Other
<p align="center">India - Second Vivekananda Bridge</p>	<p align="center">BOT</p>	<p>Under construction but expected to be completed and opened to traffic in 2007</p>	<p>To be determined</p>	<p>Project financing includes tolls and value capture from nearby economic development resulting from improved accessibility to be provided by the bridge.</p>	<p>BOT PPP and innovative financing approaches enabled this necessary bridge to be expedited to relieve congestion in the northern parts of Kolkata.</p>
<p align="center">Øresund Bridge and Tunnel (Denmark to Sweden)</p>	<p align="center">Design-Build</p>	<p>Completed in July 2000 after eight-year development and construction period</p>	<p>Coast-to-coast section completed 25 percent over budget and landside infrastructure completed 70 percent over budget</p>	<p>The Øresund highway/rail link between Denmark and Sweden has spurred economic development on both sides of the facility, especially in the vicinity of Malmö, Sweden, many of whose residents work in or near Copenhagen, Denmark.</p>	<p>This bi-modal facility was the final link in the surface transportation network of Northwest Europe.</p>

Exhibit 6.6 Key Results of Using PPPs to Deliver International Transportation Projects - continued

PPP Project	PPP Type	Timeframe	Cost	Economic Development	Other
<p>Argentina - Rosario Victoria Bridge</p>	<p>DBOM</p>	<p>Completed on schedule</p>	<p>Completed within budget</p>	<p>Bridge increased accessibility and mobility in the Mesopotamia Provinces of Argentina, spurring increased trade and between those provinces connected by the bridge and with the South American Common Market and increased economic development in the region served by the bridge.</p>	<p>Bridge produced significant increases in traffic capacity between the northern Mesopotamia Provinces of Argentina and reductions in vehicle travel times and operating costs.</p>

Exhibit 6.7 Key Results of Using PPPs to Deliver International Transit Projects

PPP Project	PPP Type	Timeframe	Cost	Economic Development	Other
Australia - Sydney Airport Transit Link	BOOT	Completed on schedule	Not available	Not available	Required A\$704 million government bailout after project was placed in receivership in November 2000, six months after opening. This resulted from ridership levels of only one-quarter what was projected for the facility. The low ridership levels for the Sydney Airport Link were exacerbated by competition from another PPP project, the Eastern Distributor highway which runs parallel to the Link.
Australia - Brisbane Airport Rail Link	BOOT	Completed on schedule	Not available	Not available	Ridership far below estimates, sharply reducing credit rating for concessionaire. Government will take over the facility after 5 years of 35-year operating concession.

Exhibit 6.8 Key Lessons from International Transportation PPP Projects

- The general public is much more accepting of tolling bridges and tunnels than highways, especially in the U.K.
- Risk management can be optimized by retaining a private sector project delivery team with extensive experience and capabilities in delivering PPP projects that meet the full terms of the contract.
- Other surface transportation facilities nearby a PPP-delivered facility may help or hurt the success of the PPP arrangement depending on if these facilities channel additional traffic to the facility or compete with the facility for the same customers.
- PPPs can benefit by combining multiple objectives that benefit numerous stakeholders, beyond just the PPP members, such as economic development, remediation of brownfield sites, congestion relief, and safety that provide a "win-win" solution set that enhances the chances of
- PPPs are being used extensively by many countries around the world to deliver surface transportation projects for which the sponsoring government or public agency lacks the financial resources to deliver the project in a reasonable timeframe. This is especially true for emerging nations in Central and Eastern Europe, Asia, and Latin/South America.
- Unique situations often require unique solutions. Differences in the legal, cultural, economic, and institutional environments by region and country make each project unique in certain ways and this needs to be taken into consideration when structuring a PPP contract agreement.
- Allow a flexible project development approach for projects that have demanding design requirements to enable the private sector team to introduce innovative design and construction techniques to better control the cost and timing of the project. This suggests the public agency partner not over design the project before bringing the PPP team on board but instead take the preliminary design process to the point where the basic requirements of the project are defined.
- PPP partners should work collaboratively and constructively in confronting obstacles that invariably arise during project development with creative solutions, instead of playing the "blame game". This requires trust among the members of the PPP.
- Obtain champions for a PPP project among top elected and appointed officials to advance PPP projects in a timely and cost-effective manner, especially in the early stages of environmental clearance, permitting, and financing.
- Successful PPPs begin with a clear understanding of the respective roles, responsibilities, risks, and returns each partner will assume during the terms of the project contract agreements with each party held accountable for delivering according to the terms of the contract.
- Members of the PPP team should maintain a spirit of openness (transparency) and cooperation throughout the project development and implementation processes, soliciting inputs from and communicating with each other and key stakeholders, including the general public. This will help keep the project moving as the parties work out issues in a collaborative manner.
- Project risk can be significantly reduced by retaining a private sector project delivery team with extensive experience and capabilities in delivering the same kind of PPP project that meet the full terms of the contract.
- Other surface transportation facilities nearby a PPP-delivered facility may help or hurt the success of the PPP arrangement depending on if these facilities channel additional traffic to the facility or compete with the facility for the same customers.

Exhibit 6.9 Critical Success Factors for PPP Transportation Projects

- Stakeholder consultation through regular meetings at both the managerial and technical levels
- Active public involvement through public outreach and on-going communication between project partners and stakeholders
- Political leadership that supports the project and serves as a champion for its successful implementation
- Secure public control of the infrastructure assets through continued public ownership and PPP team accountable for project results consistent with the contract terms
- Limited complexity of the PPP arrangement and contract agreement to ensure stakeholder understanding and compliance
- Well defined legal authority for the public sector to enter into PPP arrangements and apply alternative methods of funding, financing, and delivering transportation
- Financial viability under a wide range of risk factors
- Clear delineation and balance of project roles, responsibilities, and risks among the PPP partners commensurate with their potential returns
- Demonstrated transportation need (congestion relief, safety improvement, better accessibility, and travel time reliability) and public support among numerous stakeholder groups
- Capable public and private sector partners with mutually complementary interests in the project and a willingness to accommodate changing conditions and opportunities consistent with the desired project outcomes and performance requirements
- Adequate dedicated funding sources for the full term of the PPP contract
- Environmental constructability to ensure the project can be cost-effectively constructed without serious damage to the environment through environmental and context-sensitive design and value engineering
- Ample number of capable private sector firms and teams to ensure a competitive procurement and selection process

APPENDIX A - GLOSSARY OF TERMS

- **Build-Own-Operate:** a private contractor constructs and operates a facility while retaining ownership. The private sector is under no obligation to the government to purchase the facility or take title. “Public-Private Partnerships: Terms Related to Building and Facility Partnerships.” GAO/GDD-99-71, April 1999, <http://www.gao.gov/special/pubs/Gg99071.pdf>
- **Concession Benefits:** rights to receive revenues and other benefits (often from tolling) for a fixed period of time.
- **Construction Manager at Risk:** hired construction manager (CM) begins work on the project during the design phase to provide constructability, pricing, and sequencing analysis of the design. The CM becomes the design-build contractor when a guaranteed maximum price is agreed upon by the project sponsor and CM. (32 CFR 636.103)
- **Design-Bid-Build:** the traditional project delivery method where design and construction are sequential steps in the project development process. (32 CFR 636.103)
- **Design-Build:** an agreement that provides for design and construction of improvements by a contractor or private developer. The term encompasses design-build-maintain, design-build-operate, design-build-finance and other contracts that include services in addition to design and construction. Franchise and concession agreements are included in the term if they provide for the franchisee or concessionaire to develop the project which is the subject of the agreement. (23 C.F.R. 636.103)
- **Developer Financing:** a type of financing where a private party finances the construction or expansion of a public facility in exchange for the right to build residential housing, commercial stores, and/or industrial facilities on the site. This type of financing often takes the form of capacity credits, impact fees, or exactions. “Public-Private Partnerships: Terms Related to Building and Facility Partnerships.” GAO/GDD-99-71, April 1999, <http://www.gao.gov/special/pubs/Gg99071.pdf>
- **Electronic Toll Collection:** the use of electronic devices such as transponders, cameras, and photo-recognition technology to identify, classify, and toll vehicles entering and/or leaving a toll highway, bridge, or tunnel without the need for direct human involvement in the process or the handling of cash.
- **Innovative Contracting:** innovative contracting practices meant to improve the efficiency and quality of roadway construction, maintenance, or operation. Examples of innovative contracting include: A+B contracting, lane rental, the use of warranties, design-build, design-build-operate, design-build-finance-operate-maintain.
- **Innovative Finance:** innovative methods of financing construction, maintenance, or operation of transportation facilities. The term innovative finance covers a broad variety of non-traditional financing, including the use of private funds or the use of public funds in a new way, e.g., GARVEE bonds or special tax districts.
- **Life-Cycle Costs:** the costs of a project over its entire life: from project inception to the end of a transportation facility's design life.

- **Public-Private Partnership:** a contractual agreement formed between public and private sector partners, which allows more private sector participation than is traditional. The agreements usually involve a government agency contracting with a private company to renovate, construct, operate, maintain, and/or manage a facility or system. While the public sector usually retains ownership in the facility or system, the private party will be given additional decision rights in determining how the project or task will be completed. The term public-private partnership defines an expansive set of relationships from relatively simple contracts (e.g., A+B contracting), to development agreements that can be very complicated and technical (e.g., design-build-finance-operate-maintain). In the context of this report, the term public-private-partnership is used for any scenario under which the private sector would be more of a partner than they are under the traditional method of procurement. Further, the broad definition used for public-private partnerships includes many elements that are applied fairly regularly on appropriate projects. “Public-Private Partnerships: Terms Related to Building and Facility Partnerships.” GAO/GDD-99-71, April 1999, <http://www.gao.gov/special/pubs/Gg99071.pdf>
- **Revenue Bonds:** instruments of indebtedness issued by the public sector to finance the construction or maintenance of a transportation facility. Revenue bonds, unlike general obligation bonds, are not backed by the full faith and credit of the government, but are instead dependent on revenues from the roadway they finance. Terms Related to Public-Private Partnerships, The National Council for Public-Private Partnerships: How Partnerships Work, <http://ncppp.org/howpart/pppterms.html>
- **Shadow Tolling:** Shadow tolls are per vehicle amounts paid to a facility operator by a third party such as a sponsoring governmental entity. Shadow tolls are not paid by facility users. Shadow toll amounts paid to a facility operator vary by contract and are typically based upon the type of vehicle and distance traveled.
- **Toll Credits:** toll credits are earned when a State, a toll authority, or a private entity funds a capital highway investment with toll revenues from existing facilities. States may increase the use of available eligible Federal funding on a project, up to the normal State/local matching amount, and debit the sum of the toll credits that have been earned by that same amount.
- **Tolling:** the process of collecting revenue whereby road users are charged a fee per roadway use. Tolls may be collected on a flat-fee basis, time basis, or distance basis and may vary by type of vehicle.
- **Warranty:** when used in public-private partnerships for the construction of roads, warranty clauses guarantee that the roadway will meet a certain level of quality or else repairs will be made at the private contractor’s expense. There are currently two types of warranties used in highway construction: (1) materials and workmanship warranties and (2) performance warranties. Under the first type, the contractor is responsible only for defects caused by poor materials and workmanship. Under the latter, the contractor is responsible for the product meeting certain agreed upon performance thresholds, regardless of whether materials and workmanship met State standards.

APPENDIX B – LIST OF ACRONYMS

ASSI	Area of Specific Scientific Interest
BID	Business Improvement District
BOO	Build-Own-Operate
BOOT	Build-Own-Operate-Transfer
BOT	Build-Operate-Transfer
BTO	Build-Transfer-Operate
BRT	Bus Rapid Transit
CCTV	Closed Circuit Television Cameras
CM	Construction Manager
CM@Risk	Construction Manager at Risk
EBRD	European Bank for Reconstruction & Development
ETC	Electronic Toll Collection
IFB	Invitation for Bid
IDB	Inter-American Development Bank
JDA	Joint Development Agreement
MA	Managing Agent
MAC	Managing Agent Contractor
PDC	Project Development Contractor
PFI	Private Finance Initiative
PPP	Public-Private Partnership
RFP	Request for Proposal
RFQ	Request for Qualifications
TIF	Tax Increment Financing
TOD	Transit-Oriented Development

APPENDIX C - BIBLIOGRAPHY

The following pages contain an extensive bibliography on the use of public-private partnerships for surface transportation projects. This includes both international and domestic source material on PPPs. It should be emphasized that there is large reservoir of studies, reports, articles, and web sites devoted to the subject of transportation-related PPPs. In many cases, the web-site links to data on specific PPP projects provided to be the most robust and useful source of information regarding the description, development, financing, partnership arrangements, and results of projects selected for inclusion in this report. Therefore this bibliography also includes a listing of the key web sites that focus on PPPs, including international and U.S. sites.

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- AASHTO/FHWA Innovative Finance Website: <http://InnovativeFinance.org>
- American Public Transit Association (APTA) Website: <http://www.apta.com>
- Canadian Highway Infrastructure Website: <http://www.chichwys.com>
- Diebold Institute for Public Policy Studies Website: <http://www.dieboldinstitute.org>
- European Union Transport Activities Website: http://europa.eu.int/pol/trans/index_en.htm
- FHWA PPP Web Page: <http://www.fhwa.dot.gov/ppp>
- FHWA SAFETEA-LU Website: http://www.fhwa.dot.gov/reauthorization/safetea_bill.doc
- FHWA Asset Management Website:
<http://www.fhwa.dot.gov/infrastructure/asstmgmt/index.htm>
- FHWA TIFIA Credit Program Website: <http://tifia.fhwa.dot.gov>
- International Bridge Tunnel and Turnpike Association (IBTTA) Website:
<http://www.ibtta.org>
- National Council for Public-Private Partnerships (NCPPP) Website:
<http://www.ncppp.org/resources/index.html>
- New South Wales Ministry of Transport Website: <http://www.transport.nsw.gov.au>
- Queensland Department of Transport Website: <http://www.transport.qld.gov.au>
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- United Kingdom Highway Agency Website: <http://www.highways.gov.uk>
- Victoria Department of Infrastructure Website: <http://www.doi.vic.gov.au>
- Western Australia Main Roads Website: <http://www.mainroads.wa.gov.au>
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