



PPPs in road renovation and maintenance: a case study of the East Coast Road project

Road renovation and maintenance

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Abstract

Purpose – Public-private partnerships (PPPs) are being frequently used today to private sector investment in road projects. Most of the road PPP projects are either for new roads or for those that involve significant expansion of existing capacity. There are limited instances of PPPs for renovating and maintenance of existing roads. The purpose of this paper is to highlight the applicability of using PPPs for road renovation and maintenance projects.

Design/methodology/approach – This paper uses a case-study approach since it is an appropriate strategy to investigate a phenomenon within its real life context. The East Coast Road project was chosen for the study because it was the first project in India to use PPP for road renovation and maintenance, and being the first project of its kind, the case was of general public interest.

Findings – The paper indicates that risk levels in Rehabilitate, Improve, Maintain, Operate and Transfer (RIMOT) projects are lower than Greenfield BOT projects. Even in areas like renovation and maintenance, PPP structures can bring many advantages over traditional procurement.

Research limitations/implications – This paper has the limitations attributable to single case studies. There is a need to extend this paper to include more such case studies to evaluate their relevance for infrastructure development, particularly in emerging countries.

Practical implications – PPP structures can be useful for renovating and maintaining the existing roads. Modalities such as the RIMOT framework can have greater potential than the conventional BOT structures. Private investments in infrastructure can also be through a corporate finance structure.

Originality/value – This paper describes and analyzes the experience of India's first PPP for renovation and maintenance. The findings of this paper would have value for policy makers who are interested in attracting private sector finance and expertise in infrastructure and more specifically in roads.

Keywords Roads, Public sector organizations, Private sector organizations, Partnership, India

Paper type Case study

1. Introduction

Roads provide a major means of transport for both passengers and freight across the world. India has the second largest road network in the world with a total network of 3.3 million kilometers. However, the road conditions in India are not considered

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adequate as only 30 percent of the roads have cement concrete or bituminous pavement (Asian Development Bank (ADB, 2002)). In recent years, the Government of India has realized the importance of improving the road network for sustaining the economic growth of the country (Rastogi, 2006).

The major roads in India are classified as national and state highways. The development, construction, and maintenance of national highways is the responsibility of the central government. National highways form the arterial roads in the country and are generally better maintained than the state highways. To further improve the national highways network, the central government had taken up an ambitious program of upgrading about 38,000 kilometers at a cost of Rs 1.58 trillion (NHAI, 2008).

Both state funding as well as public-private partnerships (PPPs) are being used to finance the highway projects in India (Rastogi, 2007). The first road PPP project implemented in India was the Rau-Pithampur toll road in the State of Madhya Pradesh way back in 1992. Over the last 17 years, the momentum for PPP projects has increased significantly and different types of road projects, namely, bridges, bypasses, grade separators, and elevated expressways have been implemented in PPP format. Among all the infrastructure sectors, most of the PPP projects in India are in the road sector. Road PPP projects accounted for 62 percent of the total PPP projects, and 35 percent of the total investment in PPP projects (PPP India Database, 2009).

The state highways form important feeder routes to the national highway network and connect major towns and cities in the state. Much of the recent investments in the road sector in India have completely bypassed the state highways, and most of these roads continue to be in poor state. While 90 percent of the state highways were paved, they were characterized by a high degree of road roughness because of poor maintenance (ADB, 2002).

The main reasons for the poor condition of the state highways are:

- Since the state governments cannot match the financial strength of the central government, they have not been able to make matching improvements in state highways to what has been achieved in national highways. In addition, most of the state governments have not been very successful in attracting financing from the private sector for road projects.
- Political compulsions in India necessitate the creation of newer assets, as compared to allocating resources for maintenance of existing assets. For example, in the road sector, while most governments would proclaim the length of new roads created as one of their achievements, little would be mentioned about the successes in maintaining the quality of existing roads. This was re-emphasized by the CEO of Tamil Nadu Road Development Company (TNRDC) when he said:

Typically governments around the world are fantastic in creating assets. They take lot of glory and pride in it. There is no glory and pride in maintenance. There are often only brickbats in maintenance, and very rarely bouquets.

This had led to a situation where most of the financial resources that were available with the state government were channeled for development of new roads rather than for maintenance of existing roads. Inadequate funding for maintenance, coupled with lack of sound practices in maintenance and management of roads has resulted in the poor conditions of the existing state roads (The India Infrastructure Report, 1996). A recent newspaper article also

highlights the problems associated with government maintenance of roads (*Hindu Downtown*, 2009). Thus, while new roads were being created, the quality of existing state highways gradually declined because of poor maintenance[1].

For India to completely realize envisaged benefits from the national highway investment program, the state highway network also needs to be improved concurrently.

2. Objective of the paper

There are three main objectives for this paper. First, as indicated above, lack of proper maintenance for variety of reasons has resulted in significant erosion of the road assets, particularly in the state highways network. Most of the road PPP projects were either for new roads or for those that involve significant expansion of existing capacity, such as conversion of an existing two-lane to a six-lane road. There are limited instances of PPPs for renovating and maintenance of existing roads. By taking the East Coast Road (ECR) project as a case study, this paper studies the applicability of using PPPs for road renovation and maintenance projects.

Second, there has been limited research on PPPs in the Indian road sector. Recent research articles on the PPPs in the Indian road sector include Postigo (2008), Raghuram (2004), Singh and Satyanarayana (2006, 2009), Ray and Roy (2006) and Thomas *et al.* (2003). Given the relevance for PPPs in meeting the large investment requirements in the coming years, there is a need for more research to understand the impact and usefulness of PPPs for the road sector in India. This paper is a contribution in that direction.

Third, many state governments in India are embarking on large PPP projects in roads. Examples include the Ganga Corridor project in the State of Uttar Pradesh and the Bangalore Mysore Infrastructure Corridor in the State of Karnataka. The findings and analysis of this study can have relevance for both policy and practice in the new projects.

Rest of the paper is structured as follows: Section 3 reviews some of the recent literature on PPPs in the road sector. Section 4 indicates the research design, data sources and the data-collection methods used in the study. Section 5 provides an overview of the ECR project. Section 6 provides the analysis and discussion. The summary and key learnings from the study are given in Section 7.

3. PPP in road sector

Lockwood *et al.* (2000) provide a good overview of PPPs in toll road development. Two broad categories can be identified in the PPP projects in road sector. First is the Design, Build, Finance, and Operate (DBFO) model, adopted in the UK. DBFO is an approach adopted by the UK highways agency to award concession for PPP road projects as part of the private finance initiative[2]. An overview of the DBFO approach is provided by Klijn and Teisman (2005, pp. 99-100). Eaton and Akbiyikli (2005) provide a detailed analysis of some of the DBFO road projects that were constructed as a part of the private finance initiative. An analysis of Grimsey and Lewis (2004, p.60) feel that the main innovation in the DBFO project is that it is not seen as a conventional capital asset procurement, but more a service procurement policy where the service outcomes and performance standards are clearly specified. In a DBFO project, the concessionaire

does not have the right to collect user charges, and payment is made by a combination of shadow tolls, availability, and performance indicators.

Second is the build-own-operate/build-operate-transfer/build-transfer-operate (BOO/BOT/BTO) formats adopted in the USA (Lockwood, 1995). Under these schemes, the private consortium would finance, build, own, and operate and collect toll revenues for access to the facility during the concession period. Though the facility is owned by the government throughout the concession period, financial responsibility solely remains with the concessionaire. Under these schemes, the concessionaire has the right to collect tolls from the road users to service the project debt as well as to earn a return on equity. The differences between the different arrangements (BOO/BOT/BTO) are largely in the timing of the government's financial responsibility (Grimsey and Lewis, 2004, p.64).

The other prominent PPP approaches used in Australia (Partnerships Victoria, 2001), East Europe (American Chamber of Commerce, 2002), and Latin American countries (Engel *et al.*, 1999) can be seen as variants incorporating different features of the above two approaches as well as some new ones.

PPP projects are seen as an attractive policy option for infrastructure in developing countries (United Nations, 2002; ADB, 1998; Irwin *et al.*, 1997). However, there are several challenges seen in implementing PPPs in developing countries as infrastructure investment in these countries take place in a very different environment as compared to developed countries (Miller and Lessard, 2001a, b; Pessoa, 2006). Grimsey and Lewis (2004) indicate that some of the major obstacles to PPPs in a developing country are the absence of a legislative framework, risks seen in financing these projects, accounting for the assets created, public acceptance for PPP projects, and the shortage of capacity and skills in public administration to manage and negotiate successful projects. Akintoye (2009) in his article has also highlighted some of the reasons for the low adoption of PPP in developing countries. Though the strategy of using public-private agreements for financing infrastructure in the developing countries emerged in the middle 1980s, Pessoa (2007) indicates that implementing such projects in the developing countries still constitute a major challenge.

4. Research design and data collection

Case study approach has been used in this study since it is considered as the most appropriate strategy for understanding the dynamics present within single settings as well as to investigate the phenomenon within its real life context (Yin, 1984). The case study method also provides opportunities for the researcher to trace the events over time as well as to use multiple sources of evidence in the study.

ECR project was chosen as the case for this study because of the following reasons:

- It was the first project in India to use the PPP approach for road renovation and maintenance. For a few years after its implementation in 2002, it was the only such project in India.
- Being the first project of its kind, the case was of general public interest.
- During the initial fieldwork conducted, it was felt that there would be good accessibility to data.

A single case holistic design was adopted for the study since it was felt that it was possible to achieve a higher depth of understanding from this approach (Kimberley, 1979).

Limitations of generalisability that exist in single case studies were overcome by following a process of analytical generalization (Yin, 1984, p. 39).

Data for the study were collected from multiple sources such as documentation, field observations, and in-depth interviews as any finding or conclusion in a case study is likely to be much more convincing and accurate if it is based on different sources of information, as this results in a “within-method” triangulation (Denzin, 1978, p. 301). Documentary evidence was collected from a variety of sources such as administrative and internal documents, loan proposals, written reports of events, as well as from newspaper clippings and other articles that appeared in the mass media. These documentary sources were helpful to construct the chronology of events relating to the project. The information gaps that existed after the study of documentary evidence were probed in greater detail during the interviews. Observations made during field visits serve as another important source of evidence in a case study (McCutcheon and Meredith (1993), observations made throughout the time spent in data collection, during formal meetings, site visits and interviews also served as another important source of evidence for this study.

The main form of data collection was through in-depth interviews with key people involved in the implementation of the ECR project. The participants for the interviews were chosen based on their involvement and contribution to the project. The interviews were semi-structured where the broad area of information needed from each respondent was determined before the interview. This enabled an achieved focus during the discussion and obtaining the required information while simultaneously permitting freedom to navigate to related topics. The following gives the list of people interviewed for the study:

- Director-in-charge, TNRDC.
- Senior Vice President, Finance and Accounts, TNRDC.
- VP, Marg Constructions, Chennai and previously, Vice President, TNRDC.
- Chief Executive Officer, TNRDC.
- Transport Specialist, ADB India Resident Mission.
- Principal Water and Urban Development Specialist, ADB.

5. The ECR

The ECR connects Chennai, the capital of the South Indian State of Tamil Nadu with Cuddalore, a small coastal fishing town, 166 kilometers south of Chennai. Running along the Southern Coromandel Coast, the ECR is considered to be one of the most scenic driveways in India. The ECR passes through major tourist destinations such as Pondicherry, an erstwhile French settlement, and Mahabalipuram, an UNESCO world heritage site. En route to Pondicherry and Cuddalore, the ECR connects various fishing villages and coastal towns. The road serves as an important infrastructure link for the inhabitants in these villages to connect with the larger towns like Chennai and Pondicherry. Over the years, the ECR had led to the growth of various industries like steel rolling, chemicals, iron castings, paper, ceramic tiles, fishing nets, pharmaceuticals, cement pipes and fittings, asbestos pipes, etc. between Chennai and Pondicherry.

The ECR was originally developed by a process of interlinking and improving a series of small village roads that connected the fishing villages along the coast of

Bay of Bengal with the help of an ADB loan of US\$24.47 million during 1993-1998. The ADB assistance was helpful in converting what was once a set of rural roads to a proper two-lane facility.

However, owing to lack of resources for maintenance, the road suffered rapid deterioration in its quality and service level within two years of commissioning (Infrastructure Leasing & Financial Services (IL&FS, 2005)). Apart from the strategic importance of the ECR as a key means of improving coastal connectivity and as a route that leads to several tourist destinations, it was felt that an improved road corridor would also lead to significant reduction in travel time and vehicle operating costs, resulting in significant economic benefits. ADB (2002) had estimated an economic rate of return of 18.5 percent from upgrading the ECR. During the interviews, the CEO had indicated that the project internal rate of return was estimated around 15 percent.

The ECR upgrade project

In a move to address the problems of poor maintenance and operations of ECR on a long-term basis, the Government of Tamil Nadu (GoTN) undertook a major renovation and upgrade project on a PPP format. Salient features of the project are given in Table I. The project was implemented by TNRDC, an organization set up by GoTN in 1998 for

Component	Details
Initial project cost	Rs 600 million
Length	113.2 kilometres
Main features of the project	<p>Widening of carriageway to 7-metres width for almost the entire stretch of the road</p> <p>Construction of shoulders on both sides of the pavement for the entire stretch of the project road</p> <p>Improvement of six major intersections along the project road, including provision of lighting arrangements and traffic control systems</p> <p>Strengthening of the pavement where necessary and resurfacing for the entire stretch of the project road</p> <p>Camber and super elevation correction where necessary</p> <p>Geometric improvements along nine stretches of the project road which were identified as accident prone</p> <p>Provide traffic signs and other road furniture as per Indian Road Congress specifications</p> <p>Building seven village bypasses</p> <p>Rehabilitation and repair works on bridges and culverts</p> <p>Construction and manning of Toll plaza</p> <p>Properly designed bus bays to improve safety and level of service to road users</p>
Loss of tree cover	851 trees were estimated to be cut. To compensate for the loss of this tree cover, provision was made for plantation of over 10,000 trees
Project affected persons	A total 167 families will suffer displacement because of acquisition of lands and structures along the project road
Total land acquisition	12.5 acres

Source: ECR concession agreement

Table I.
Important details
of the ECR upgrade and
maintenance project

developing the state roads under the PPP framework. TNRDC is a 50:50 joint venture between Tamil Nadu Industrial Development Corporation (TIDCO), the investment arm of GoTN, and IL&FS, a well-known infrastructure development and financial services company.

The project was implemented under the Rehabilitate, Improve, Maintain, Operate and Transfer (RIMOT) format. “Rehabilitate” and “Improve” involved upgrading and renovation of the existing road. “Maintain” involved periodical monitoring and maintenance during the concession period. “Operate” involved responsibility for day-to-day activities such as toll collection and provision for value-added services like highway patrolling, ambulance, break down tow away service, emergency call boxes, etc.[3]. “Transfer” indicates that the project operation rights would revert to the government after the expiration of the concession period.

The concession agreement

GoTN gave an in-principle approval for the upgrade project on February 11, 2000. Subsequently, on December 22, 2000, GoTN signed a concession agreement with TNRDC, for upgrading a major stretch of the ECR. The concession agreement outlined the obligations of GoTN and TNRDC pertaining to the project, conditions precedent, scope of improvement, operations and maintenance (O&M) works, tolling, appointment of independent engineer and independent auditor and other contractual features including those relating to force majeure events, termination, suspension, insurance and lender’s rights. The concession was provided for a period of 30 years (excluding one year for construction activities) from February 2001 when the project achieved financial closure.

The ECR project was one of the early PPP initiatives in the state, when private companies were still warming up to the idea of investing in the infrastructure sector[4]. In line with the situation that existed then, the concession agreement had several attractive features for the concessionaire. The most important feature of the concession agreement was the guaranteed return on the project investment. The agreement provided an assured return of 20 percent on the outstanding cost of the project[5]. An illustration of the return calculations are given in Table II. The concession agreement also provided for an annual increase of 8 percent in toll charges.

Financing the project

Instead of a non-recourse project finance structure that is normally used in private sector infrastructure projects, the ECR upgrade project was funded as a conventional corporate finance project under TNRDC. Since this was the only major project for TNRDC at that point of time, the funds raised by the company were predominantly utilized for this project. The details of the financing structure at the beginning of the project (November 2002) are given in Table III. The entire project debt of Rs 510 million was initially provided by IL&FS (Table IV).

During 2002-2003, IL&FS split the senior debt of Rs 410 million into two tranches: Part I debt of Rs 250 million and Part II senior debt of Rs 160 million and sold off Part I debt to Punjab National Bank, one of the leading public sector banks in India, at an effective interest rate of 9 percent per annum. IL&FS was able to sell the debt at a much lower interest rate because the bonds received an AAA rating (Narayanan and Joshi, 2003) based on the corporate guarantee provided by IL&FS for interest

Table II.
Indicative illustration
of the recovery
of outstanding cost of
project (OCP) and assured
returns (20 percent per
annum) over a eight-year
period

Year	Quarter	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9) = (5) - (6 + 7 + 8)	Returns (10) = 5% of (3 + 4), i.e. 20% p.a.	Surplus (11)	To set off against OCP (12) = (9 - 10 - 11)	Closing OCP (13)
1	1	1,000.0				50.0	2.0			48.0	50.0		-2.0	1,002.0
	2	1,002.0				53.0	4.0			49.0	50.1		-1.1	1,003.1
	3	1,003.1				56.2	6.0			50.2	50.2		0.0	1,003.1
	4	1,003.1				59.6	8.0			51.6	50.2		1.4	1,001.6
2	1	1,001.6				63.1	10.0			53.1	50.1		3.0	998.6
	2	998.6				66.9	12.0			54.9	49.9		5.0	983.6
	3	983.6				70.9	14.0			56.9	49.7		7.2	986.4
	4	986.4				75.2	16.0			59.2	49.3		9.9	976.5
3	1	976.5				79.7	18.0			61.7	48.8		12.9	963.6
	2	963.6				84.5	20.0			64.5	48.2		16.3	947.3
	3	947.3				89.5	22.0			67.5	47.4		20.1	927.2
	4	927.2				94.9	24.0			70.9	46.4		24.5	902.7
4	1	902.7				100.6	26.0			74.6	45.1		29.5	873.2
	2	873.2				106.6	28.0			78.6	43.7		34.9	838.2
	3	838.2				113.0	30.0			83.0	41.9		41.1	797.2
	4	797.2				119.8	32.0			87.8	39.9		47.9	749.2
5	1	749.2	80.0			125.8	35.0			90.8	41.5		49.3	779.9
	2	779.9	95.0			132.1	38.0			94.1	43.7		50.4	824.5
	3	824.5	110.0			138.7	41.0			97.7	46.7		51.0	883.5
	4	883.5	125.0			145.7	44.0			101.7	50.4		51.3	957.3
6	1	957.3				152.9	48.0	1.0	1.0	102.9	47.9		53.0	904.2
	2	904.2				159.1	52.0	1.0	2.0	104.1	45.2		56.9	847.3
	3	847.3				165.4	56.0	1.0	3.0	105.4	42.4	2.0	61.0	786.3
	4	786.3				172.0	60.0	1.0	4.0	107.0	39.3	2.0	65.7	720.6
7	1	720.6				178.9	64.0	1.0	5.0	108.9	36.0	2.0	70.9	649.8
	2	649.8				186.1	68.0	1.0	6.0	111.1	32.5	2.0	76.6	573.2
	3	573.2				193.5	72.0	1.0	7.0	113.5	28.7	2.0	82.8	490.3
	4	490.3				201.3	76.0	1.0	8.0	116.3	24.5	2.0	89.8	400.5
8	1	400.5				209.3	80.0	1.0	9.0	119.3	20.0	2.0	97.3	303.2
	2	303.2				217.7	84.0	1.0	10.0	122.7	15.2	2.0	105.5	197.7
	3	197.7				226.4	88.0	1.0	11.0	126.4	9.9	2.0	114.5	83.2
	4	83.2				235.4	92.0	1.0	12.0	130.4	4.2	2.0	124.2	-41.0

Notes: OCP – outstanding cost of project; this will include the initial project cost and any major maintenance expenses incurred
Source: Based on the concession agreement

	As on 30 November 2002	As at end of FY05
<i>Equity</i>		
GoTN/TIDCO	50	325
IL&FS	50	50
Total equity	100	375
<i>Debt</i>		
Subordinate debt		
IL&FS	100	0
Senior Debt		
IL&FS (Part I ^a)	250	0
IL&FS (Part II)	160	0
Punjab National Bank	0	250
Interest free unsecured loan from GoTN/TIDCO	0	115
Total debt	510	365
Total liabilities	610	740

Notes: All figures in Rs million; ^aPart I debt has higher priority for servicing interest and principal obligation than Part II debt

Table III.
TNRDC: long-term
funding sources

Month	Rs/\$	Rs/€
September 1988	14.51	
March 1999	42.53	
February 2000	43.62	42.95
December 2000	46.79	42.14
February 2001	46.55	42.95
December 2001	48.00	42.83
March 2002	48.82	42.76
January 2003	48.03	51.01
January 2004	45.51	57.35
January 2005	43.71	57.46
January 2006	44.42	53.71
January 2007	44.29	57.59

Sources: ADB (2002); www.oanda.com/convert/fxhistory

Table IV.
Average currency
conversion rates

and principal repayments. The softening of the interest rates during this period, also partly contributed in Part I debt being sold at a lower interest rates[6].

In 2003-2004, given its ECR experience, TNRDC got a mandate from GoTN[7] to implement the IT corridor project[8] and received Rs 340 million towards the same. This amount consisted of a financial assistance of Rs 125 million from the Government of India and the remaining Rs 215 million from GoTN. Since the expenditure for the IT corridor project was expected only in the latter half of 2005-2006, TNRDC used the above assistance to restructure the entire sub-ordinate debt and Part II senior debt. The equity to total capital ratio following the capital restructuring increased dramatically from 16 to 51 percent. The capital structure of TNRDC at the end of FY05 is also given in Table III. Following the fund infusion by GoTN, TNRDC was well capitalized to raise debt from the market at competitive rates.

Project operations

The project was successfully commissioned in March 2002. TNRDC began its toll collection from ECR users from March 24, 2002[9]. Over 90 percent of the project revenues was expected from tolls with the balance from other sources such as advertisement banners and hoardings. Two-wheelers, non-motorized vehicles and tractors, and vehicles such as ambulances, fire tenders and postal service vehicles were exempted from the toll. Discounted tolls were provided to state transport corporation buses, frequent users of the road, as well as to the vehicles owned by the *bona fide* local residents living in the ECR stretch.

However, after commissioning the project, the GoTN was reluctant to implement the 8 percent yearly toll increase, because of political compulsions. Though the concession agreement provides for an automatic increase of yearly tolls by the concessionaire, the government's forbearance on this issue meant that yearly toll increases did not materialize. Meanwhile, a ban on sand quarrying from a river bed situated along the project stretch led to stoppage of movement of sand bearing trucks on the road. The sand-bearing trucks were expected to contribute about one-third of the projected revenue. Adding to the revenue crunch, was the discount on monthly passes availed by State Transport Corporation buses, which were in excess of 70-80 percent and were not linked to number of trips made. As each bus made multiple trips each day, the effective discount rate was much higher leading to loss of revenues to TNRDC.

Under these circumstances, the amount available from operations was unable to cover the targeted returns, leading to shortfalls. In 2002-2003, the project experienced financial difficulties, as the government did not issue the notification for toll revision that had been originally planned. Instead of the toll revision, the government sanctioned financial assistance of Rs 50 million as an interest free unsecured loan to TNRDC to recover from its short-term financial difficulties. This financial assistance enabled TNRDC to continue its debt repayment, and O&M obligations as per the contract. However, subsequent growth in traffic flows improved the financial position and the company was able to achieve profitability from project operations in FY05. Key financials of the company are given in Table V.

6. Analysis

Project risk assessment

The endogenous risk levels in a RIMOT road project is lower as compared to a Greenfield BOT road project. For example, an important source of risk in a road project is the construction risk, leading to delays in project completion and/or cost overruns. Since the ECR project was only an upgrading project, the components that usually increase the construction risk, such as formation of alignment, land acquisition, or environmental impact, was marginal or absent. No new road alignment was required to be done as the road already existed. Only minor changes in alignment were needed to address safety issues. In addition, as given in Table I, the project involved minimal impact on the surrounding environment and local inhabitants. With the advances in pavement engineering and project management techniques, renovation of this road was considered to be a straightforward task[10]. Construction risk in the project was therefore minimal as there were no complex structures, such as under-passes, over bridges, or interchanges, which needed to be constructed.

Year		2005-2006	2004-2005	Road renovation and maintenance
<i>Income</i>				
ECR Toll and other revenues		97.56	94.35	
Other operating income		105.18	48.85	
Misc. income		2.34	1.48	
Total income	A	205.07	144.68	
<i>Expenditure</i>				
Operating and admn. expenses	B	113.95	64.04	
Provision for doubtful advances		-	0.22	
Interest and financing charges	C	41.40	57.63	
Depreciation	D	19.61	19.29	
Misc. expenditures written off		1.10	1.37	
Total expenses	E	176.07	142.55	
Profit before prior period item	$F = A - E$	29.00	2.13	
Profit period item (net)		0.78	-	
PBT	G	29.78	2.13	
Provision for tax	H	24.72	1.55	
PAT	$I = G - H$	5.06	0.58	
Operating margins	$(A - B)/A$	44.43%	55.74%	
Total cash generation from operations	$I + C + D$	66.08	77.50	

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Table V.
Abridged income statements for TNRDC

Project risk management

Previous research has indicated that long-term success of PPP projects largely depends upon effective risk management throughout the project life cycle (Ibrahim *et al.*, 2006). Successful risk management strategies involve allocating various risks through a contractual framework to those participants who are able to manage those risks better (Miller and Lessard, 2001a, b). Table VI provides a summary of important risks in the ECR project and the mitigation strategy that has been adopted for each of those risks.

The key risks during the project operations would be maintenance risk and revenue risk. Since traffic flow depended on the condition of the road, one of the key success factors for the ECR project would be the regular maintenance of the road. The maintenance risk was mitigated by making the construction contractor responsible for regular maintenance of the road as well. This was an incentive to the construction contractor as planned future maintenance investments would result in a steady revenue stream. Despite the bundling of construction and maintenance contracts, TNRDC provided clear specifications for road maintenance. To ensure proper maintenance, detailed inspection schedules by GoTN and TNRDC were specified in the concession agreement.

Revenue risk comprises of two components: tolling risk and traffic risk. Tolling risk was largely mitigated by using state-of-the-art integrated toll collection mechanisms and audit mechanisms. While the uncertainty with respect to demand and traffic constitutes a residual risk and has to be borne by the project, several measures were adopted to reduce the traffic risk. The first was the suggestion by GoTN to avoid the yearly increases in tolls. While the short-term impact of this move on the project was negative, resulting in lower revenues, it served the purpose of attracting users to

S. no.	Risk type	Risk identification	Mitigation strategies
1	Construction	Engineering risk	Use of appropriate contracting mechanism and two-stage competitive bidding process Clear definition of performance and quality like road roughness index, deterioration levels, geometries, etc.
		Land acquisition and environmental clearance risk	Government support through representation in TNRDC's board Supporting framework under the Highways Act of 2001
2	Maintenance	Road quality deterioration	Defining stringent performance measures and periodic evaluation of road quality by independent authorities Incentivizing engineering contractors by bundling road building and maintenance contracts thereby providing assured revenue streams
3	Financing	Higher interest rates, closing fees on debts from IL&FS	Financing support and commitment from GoTN in times of distress Corporate finance structure enabled efficient routing of funds from the government and also exploring other revenue streams like consulting, advertisement, etc.
4	Operational	Tolling risk	Use of integrated technology like bar-coded passes, video cameras and security patrolling to prevent pilferage
		Timely toll revision notification by the government	Traffic growth beyond projections compensated for the loss of revenues from failure of toll revision notification from the government

Table VI.
Summary of risks and mitigation strategies of ECR Project

the road. The concept of toll roads was still new in India in 2002 and the government did not want to discourage the users of the road because of high tolls.

Traffic projections for the ECR project conducted by the engineering consultant indicated an annual average traffic growth rate of 10 percent. The projections made by ADB indicated a much lower average growth rate of 7.5 percent. But, the actual traffic has exceeded the projections and has grown at an average rate of 11 percent. The strong traffic growth largely compensated the company for the non-increase in toll rates. This traffic growth has also led to a concomitant increase in industrial and commercial investment in the areas surrounding the ECR, which in turn has further contributed to the traffic growth, thereby creating a virtuous cycle between traffic growth and development.

Other measures to mitigate the revenue risk were specified in different clauses in the concession agreement. For example, Article 2.4 of the concession agreement provided that:

In the event that the concessionaire has not recovered the outstanding cost of project and returns thereon on the date 31 years from the financial close, the concession period shall at the

request of the concessionaire, without qualification, be extended by GoTN for a period of two years at a time until the outstanding cost of project and the returns thereon have been recovered by the concessionaire; provided that [...] GoTN is not obliged to extend the concession period beyond 36 years from the date of financial close.

Article 2.13 of the concession agreement specified that:

GoTN agrees and undertakes not to construct nor operate either by itself or by any other competent authority or have the same inter-alia built and operated on commercial basis or otherwise a competing facility either toll free or otherwise during the concession period.

Many of the above risk management measures such as obtaining various project clearances, joint supervision of maintenance, non-escalation of toll rates for long-term project benefits, financial support in times of need, etc. would have been difficult to implement in a standard services procurement exercise. For example, the board of TNRDC had seven members, out of which six members represented GoTN and IL&FS in equal proportion. The presence of senior members such as the GoTN Highways Secretary in the board greatly helped the company in getting the necessary clearances and approvals from different organizations of the state and central government, leading to successful completion of the project. For instance, land acquisition, which can result in litigation by land owners and invariably lead to delays, was handled efficiently by GoTN with support from TNRDC team. GoTN with the support of the central government stepped forward to ensure issuance of clearances, land acquisitions, notification of toll collection, maintenance of law and order and provided financial support all through the project implementation. The Highways Act of 2001 ensured that land acquisition litigations were quickly disposed of in favor of TNRDC and GoTN[11]. Various other project risks related to clearances and approvals were allocated between the concessionaire and GoTN as indicated in the concession agreement:

If the clearance is of a type relating to the project as a whole, it shall be allocated to the GoTN, and if the clearance is related to specific activities falling within the scope of work of the concessionaire, then it shall be the responsibility of the concessionaire.

Investment in infrastructure assets such as roads have a very high degree of asset specificity. It has been indicated that investment in those assets that have asset specificity characteristics can lead to costly agency conflicts between the transacting parties (Williamson, 1985; Klein *et al.*, 1978) and joint ownership structures can resolve these conflicts (Jensen and Meckling, 1976; Grossman and Hart, 1986). Structuring the ECR upgrade project as a PPP project helped to allocate and manage risks much better as compared to traditional procurement.

Project financing

The initial project capital, both debt and equity, was completely contributed by the sponsors. At a time when there was not much experience in PPPs in India, the complete contribution from the sponsors indicated their commitment to their project. Since the project cost was not very high[12], the sponsors were able to contribute the complete requirement without the need for large syndication that is frequently seen in private infrastructure projects (Esty, 2002; Dennis and Mullineaux, 2000). IL&FS provided about 92 percent of the total project capital requirements (Rs 560 million in

both debt and equity), with the remaining being contributed by the GoTN. The initial seed capital of (Rs 5 million) from the GoTN as public equity contribution can be seen to have reduced the risk perception of the private investor (Grimsey and Lewis, 2004). The entire contribution from the sponsors also helped the project in two other ways.

First, there is a high level of information asymmetry during the initial development phase of the project as the sponsors would know more about the project than the external investors. Raising external capital under such conditions of information asymmetry can result in significant transaction costs (Leland and Pyle, 1977; Myers and Majluf, 1984). Since the ECR project was completely funded by the sponsors to start with, there was no need to incur the transaction costs associated with external investment. This can be seen from the quick financial closure that was achieved for the project.

The second benefit from the project being completely funded by the sponsors is the ability to achieve high levels of leverage. As given in Table III, the debt to capital ratio in 2002 was 0.83. Such high levels of debt helps to keep the cost of capital for the project lower. Importantly, the high amount of debt also benefits the project by limiting managerial discretion over free cash flow (Finnerty, 1996; Kensinger and Martin, 1988); and forcing managers to function efficiently and generate cash flows to pay out interest and debt in the early years of the project (Hart Hart and Moore, 1995). Debt also provides sponsors the benefits of creditor monitoring of managerial actions (Diamond, 1984; Esty, 2001; James, 1987).

Haley (1992) indicates that innovative financial techniques help to ameliorate the risks faced by PPP projects in emerging economies. He indicates that, "financial engineering instead of civil engineering has become the key to the success of a project" (p. 65). The ECR project also witnessed two levels of financial restructuring. In the first stage, IL&FS, the original lenders to the project sold their project loan to Punjab National Bank, after the project began operations. In the second stage, the high cost debt was retired using funds obtained from government grants. By helping to reduce the cost of capital, these financial restructuring activities contributed to the success of the project.

7. Summary and key learnings

For India to continue its growth on a sustainable path, investment in infrastructure is critical. Infrastructure bottlenecks are seen as one of the leading obstacles for India in realizing its economic growth potential (Chen and Kubik, 2007). Private sector involvement in infrastructure PPP projects can be largely seen as having two distinct elements: operational and financial (Jenkinson, 2003). Since the project cost of the ECR is not very large, the present case study can be seen as an instance of private sector contributing largely to the operational element. The key learnings from the ECR project can be summarized as follows.

BOT structure that is commonly seen in road PPP projects is the most difficult to implement. This case study reaffirms ADB's (2001) view that modalities other than BOT such as the RIMOT framework used in the ECR project can have potentially much greater application than BOT projects. This paper highlights the relevance for extended approaches such as RIMOT for implementing successful PPP projects in the road sector. During the initial stages of launching a PPP program, structuring the projects on the ECR model can be a good media for attracting private sector investment

in the first few projects. Such projects have low capital costs, take less time for development and construction, have lower risks, and would therefore have a better probability of success as compared to a new project. Demonstration of initial success can be very important for attracting subsequent investments in the PPP projects. Once the private sector develops the comfort from investing in such projects, they would be more forthcoming in investing in much larger and ambitious projects (Horner, 1999). This paper also highlights the relevance of exploring PPP formats not only in new roads but also for rehabilitation and maintenance of existing roads. As indicated by the CEO of TNRDC:

This project helped us do asset preservation. It also helped to exploit the asset gainfully and productively.

This project also indicates the advantages of a PPP format over traditional procurement. The ECR project is yet another example of gaining from the strengths of the private sector. A key problem of the state highways in India has been the poor maintenance. By forming a PPP structure, the government was able to capitalize on the strengths of the private sector in project management and maintenance. The rehabilitation and maintenance could have definitely been outsourced as a traditional procurement. But involving the private sector as an equity shareholder brought in more commitment and greater involvement, which benefitted the government and the public at large. As indicated by the CEO of TNRDC:

When similar projects were completed over 24-36 months, the ECR project was completed in just little over 10 months and has been actively maintained till date.

Innovative project structure that is most appropriate to the situation should be adopted. Traditionally, most private sector infrastructure investments have followed the non-recourse or project financing method. However, the implementation of the ECR project was done by the traditional corporate finance format, which is not usually adopted for private sector infrastructure projects. This provided several advantages. First, it helped to avoid legal and other incorporation costs associated with setting up a separate company (Esty, 2003; Klein *et al.*, 1996). Incorporating special purpose vehicles for individual projects would be beneficial only for large projects, as smaller projects would not be able to absorb the substantial costs associated with setting up a new company. Second, the traditional corporate structure provided more flexibility to TNRDC in financial management and to explore other sources of revenue at times of distress. For example, TNRDC was able to generate additional revenue streams from maintenance of flyovers, and provide consultancy services for a variety of assignments for road sector projects in the state.

Traditionally, only four-lane roads were being tolled in India. ECR was the first two-lane toll road in the country. Till then, the National Highways Authority of India policy allowed tolling of only those roads that had a minimum of four lanes. Conversion of a two-lane road to a four-lane road involved substantial investments in capital and time. In many cases, the traffic flows in a two-lane road might not be high enough to justify the investments for a four-lane road. The concept of a 7 meters wide two-lane road with paved shoulders of 1.75 meters on the both sides as seen in the ECR project has been found to be an acceptable intermediate solution for roads supporting traffic of 6,000-15,000 passenger car units[13,14]. A new four-lane road which costs

upward Rs 55 million per kilometer can cost as low as Rs 15 million per kilometer when it is modeled as a paved two lane capacity. Improvement of such two-lane roads to a toll facility not only reduces accidents but also increases the traffic carrying capacity of the roads while simultaneously providing better driving and riding comfort.

The ECR project was constructed within the estimated costs and time, which is not often seen in infrastructure projects (Flyvbjerg *et al.*, 2002, 2003). Since the project began operations, there has been a steady increase in revenues. Average daily revenue collections increased from Rs 172,000 in 2002-2003 to Rs 210,400 in 2005-2006 and to Rs 257,534 in the 2006-2007. The average growth in traffic has been around 11 percent and the increased traffic has compensated for the lack of toll revisions and the project has started generating cash profits within a few years of starting operations.

Following the initial success, many states have started adopting the structure of the ECR project for development of their existing road network[15]. With more than 82 percent of state roads in India being single lanes, the RIMOT format used in the ECR project could be seen as an effective model for rapidly upgrading existing single- and two-lane state roads at competitive costs. A direction for future research could be to study more such case studies that have adopted modalities other than BOT and to evaluate their relevance for infrastructure development, particularly in emerging countries.

Notes

1. Dr Manmohan Singh, the Prime Minister of India, once commented about the poor maintenance of roads as, "We are losing road assets worth thousands of crores annually due to poor road maintenance." (www.andhranews.net/India/2007/May/23-Manmohan-Singh-finds-2206.asp (assessed May 25, 2008)).
2. A detailed overview of Private Finance Initiative is provided by Allen (2001).
3. According to the concession agreement, the concessionaire would have to provide a host of value-added services such as 24-hour trauma care and ambulance facilities, round-the-clock patrolling and security services, vehicle break-down/tow-away services on-call basis and help-line telephone facilities for every 3 kilometers.
4. ECR renovation, covering a distance of 113.2 kilometers, was the third and the largest PPP project to be implemented then in Tamil Nadu. The two earlier PPP projects were the 27.67 kilometers bypass road for the Coimbatore city and a 387-metre bridge at Karanodai near Chennai (from the State highways policy note for 2007-2008, available at: www.tn.gov.in/policynotes/archives/policy2007-08/pdf/highways.pdf (accessed June 16, 2009)).
5. The financial structure allowed the recovery of OCP which is the sum of initial project cost, shortfalls in recovery of targeted returns and major maintenance expenditure from the net cash flows available from the operations after deducting operations and maintenance expenses over the concession period.
6. Reserve Bank of India data indicate that 3-month MIBOR rates (inter-bank offer rates) which were 10.64 percent in January 2001, reduced to 4.91 percent in January 2004. It later increased to 6.77 percent in January 2006, available at: www.rbi.org
7. Government Order No. 14 dated January 23, 2004.
8. IT Corridor project involved improving a 20.1 kilometers stretch on the Old Mahabalipuram Road, from Madhya Kailash to Siruseri. GoTN was promoting this as an investment corridor to the IT industry and renovation of the existing road to a six-lane expressway project was

a part of that initiative. However, for implementing the IT corridor project, TNRDC created a separate subsidiary special purpose project finance company called the IT Expressway Ltd.

9. "ECR to become toll road from tomorrow" (*Hindu Business Line*, March 23, 2002).
10. TNRDC appointed Wilbur Smith Associates Private Limited, then known as Kampsax India Limited, as the design engineering consultant for carrying out the detailed design of the project. The consultant felt that while the project itself was straight forward, the only significant challenge was the geometric design of the road because of several critical curves along the alignment.
11. Highways Act of 2001 provided adequate powers to the Highways Authorities of GoTN to stop ribbon development, thereby facilitating eviction of unauthorized encroachment in the highways boundary.
12. The project investment as compared to the financial size of the sponsors. For FY02, IL&FS reported a total gross asset base of Rs 41.87 billion and total revenues of Rs 5.22 billion (Narayanan and Joshi, 2003).
13. Car = 1 PCU, 1 truck (9 tonnes) = 2.5 PCUs. Source: Project Appraisal document, Loan Report No: 30085-IN, World Bank.
14. The paved shoulders have been provided to support slow moving traffic on such roads, such as bicycles and pedestrians.
15. Given the initial success of the ECR project, many states are now considering to adopt the ECR framework in their respective states. The model is being scaled up and implemented over 1,053 kilometer of State highways in the North State of Rajasthan. This project is being implemented by Road Infrastructure Development Company of Rajasthan Ltd (RIDCOR), a 50:50 joint initiative of Government of Rajasthan and IL&FS. The project cost is estimated at around Rs 15 billion.

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