

# Techno-Economic Analysis of BOT Municipal Infrastructure Project– A Case Study

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**Abstract - Development of proper infra structure is essential for economic growth of any country. To meet the present gap in the fund requirement of the infrastructure for the urban development it is imperative to promote public and private partnership. BOT has been one of the recent innovations in project finance of municipal projects. The Build-Operate-Transfer (BOT) scheme is a limited recourse financing technique. Many have adopted this approach as an alternative to traditional public financing for infrastructure development projects. It examines the type of capital and debt in project financing. In addition, it examines the financial instruments used in project financing.**

**Key words: BOT, Financing, Infrastructure, IRDP, Toll.**

## I. INTRODUCTION

India is a developing country and transportation forms the backbone of the Indian economy. Traditionally, financing of large-scale investment projects such as infrastructure development was solely considered the responsibility of the public sector. In recent years, a growing trend emerged among governments in many countries to solicit investments for public projects from the private sector. The main reasons for this trend are a shortage of public funds and handsoff approach of government agencies. The Build Operate Transfer approach (BOT) is an option for the government to outsource public projects to the private sector. With BOT, the private sector designs, finances, constructs and operates the facility and eventually, after a specified concession period, the ownership is transferred to the government. Therefore, BOT can be seen as a developing technique for infrastructure projects by using private initiative and funding for the development.

### 1.1 Special features of infrastructure projects.

Infrastructure projects include a wide array of public facilities with the primary function to serve public needs, to provide social services and promote economic activity in the private sector. The most common examples are roads, bridges, water and sewer systems, airports, some of the special features include

- i) Large Capital requirement
- ii) High sunk cost
- iii) Long gestation period
- iv) Slow returns
- v) Sector is sensitive to political environment and policy changes
- vi) The service produced are non tradable.

No single solution applies to different projects as characteristics are different from sector to sector. Rakesh Mohan committee has advocated conscious usage of available government resources to take significant equity positions in infrastructure project. In addition to government, the private sector may initiate BOT projects for urban development when there are limited funds available and there are no enough resources to execute successfully a required project.

### 1.2 Types of Privatization

Following models are available for road infrastructure.

Sr No	Name	Description
1	Build operate transfer(BOT)	Concession is given to private party to finance, build, operate and maintain the facility. At the end of concession ,the facility reverts back to Govt.
2	Build own operate ( BOO )	Similar to BOT without the transfer of ownership
3	Build own operate transfer ( BOOT )	Same as BOT but the project is transferred to Govt. after negotiated period
4	Build transfer lease ( BTLO )	Govt. provides the right of way, the private party has to pay a nominal rent for the use of the land
5	Develop Build Operate(DBO)	New concept initially the company does not assume commercial risk but later assumes the risk as per norms laid by Govt.

## II. RESEARCH METHODOLOGY

**2.1 BOT PROJECTS.** A BOT project is typically regulated by the government on key issues of the project performances and price of the service. In the BOT approach, the government grants a private sector the rights to finance, develop, and operate a revenue producing toll road for a defined time period (i.e., concession period) after which the facility is transferred back to the government.

- BOT is the classic tool for project finance. As it relates to new build, there is no revenue stream from the outset.
- Project Company obtains financing for the project, and procures the design and construction of the works and operates the facility during the concession period.
- Project company is a special purpose vehicle, its shareholders will often include companies with construction and/or operation experience, and with input supply and offtake purchase capabilities.
- Project company will co-ordinate the construction and operation of the project in accordance with the requirements of the concession agreement.
- The revenues generated from the operation phase are intended to cover operating costs, maintenance, repayment of debt principal (which represents a significant portion of development and construction costs), financing costs (including interest and fees), and a return for the shareholders of the special purpose company.

## 2.2 Why BOT are Costly?

**BOT** projects are normally costlier if it is compared to with the project report prepared by Govt. departments. Following are causes. Full funding has to be by the private company and hence full project cost is required to be mobilized.

- Burden of interest during the construction on loans
- Cash flow a major problem (each and every thing to be insured)
- Returns are not assured
- All liabilities of debt service and equity return commences after physical completion of project
- Pre bid/post bid award expenses are high
- Cost all risk taken by entrepreneur
- Contingences on legal, political and technical including development cost.

## 2.3. Financing & subsidy for BOT projects

Normal sources for financing of private infrastructure s are debt and equity. Govt. of India has allowed debt-equityratio in such cases as 5:1.As these projects are unknown risk, financier always like to have higher equity participation .one specialty of infrastructure project is that it has monopolistic market and hence much more assured revenue stream. There are many sources of debt available. Normally Govt. of India allows “Real State Development’ in the project which is actually sub project of bigger projects and the debt equity ratio may be different. As infrastructure projects are very costly, Govt. has felt the need for giving some sort of subsidy other forms of subsidy may be considered to make the project viable.

## III. ANALYSES AND SYNTHESIS OF CASE STUDY

### 3.1 Project Background and Objectives

Kolhapur is major developing city in western Maharashtra well known for its industrial development and agricultural products. Besides national highway there are four major highways passing through heart of Kolhapur city, thus bringing heavy amount of traffic from all directions .In view of increasing traffic Kolhapur city road development plan was approved by state Government, and an Integrated road development Plan (IRDP) was prepared. Because of the paucity of it was decided to implement the project through BOT with the following objective

- i) Develop and establish net work of main roadsas well as main entrance &link routes to city
- ii) Widen and develop roads to full DP width with central divider and side footpaths.
- iii) Improvement of junctions and enhancement of aesthetics.

### 3.2 Salient Features of the Project

I. General Data: Construction of integrated road development programme (IRDP) in the city on BOT basis.

Name of client - Kolhapur Municipal Corporation

Name of facilitator - State Road Development Corporation

Name of the Company - I.R.B.

Type of contract - B.O.T.

Estimated cost of project - 220 crores.

Date of work order - 14/2/2008

Duration of project - 2 years  
Concession period - 30 years fix.

### 3.3 Scope of Work:

Four laning of Carriageway = 49.99 Kms  
Improvement and Widening of Major Bridges = 1 No.  
Improvement and Widening of Minor Bridges = 08 Nos.  
Reconstruction widening of culverts = 54 nos.  
Construction of R.O.B = 01 Nos.  
Improvement of Major & Minor junctions = 18 Nos.  
Development of major junctions = 54 nos.  
Landscaping of spots = 05 nos.  
Providing Bus Shelters = 19 Nos.  
Sculptures in traffic islands with decorative railings = 10 nos  
Seat outs= 130 nos.  
Toll Plaza Complex = 09 Nos.  
Providing Highway Lighting  
Adequate Road Furniture  
Operation and Maintenance till end of concession Period.

## IV. DISCUSSION

### 4.1 Road Inventory:

The total project roads are classified into three categories namely External Routes (ER), Internal Routes (ER), and Link Routes (LR). Out of the total project 49.99km road length of the road, External Routes are amounting to 30.79 km. Internal Routes 5.6km and remaining 12.60km are Link Routes. The DP plan width wise breakup of the total project roads is 3.5 km roads of 15m, DP width 19.07km roads of 18m, DP width 7.20km road of 24m DP width and the balance 20.22km roads are with 30m DP width respectively.

### 4.2 Traffic growth & Traffic Projection:

The traffic in 2007 was 54682 PCU/day was exceeding the capacity of the road. As per the tender document the traffic growth rate projected is upto 10 years -7%, 10-20 years -6%, 20-30 years -5%. Traffic projection upto year 2037 is 5.5%.

### 4.3 Financial feasibility

Financial feasibility for the BOT project development was based on discounted cash flow (DCF) model, which is one of the most widely used technique for financial evaluation. The DCF model brings together all the cash flow profiles of a project over the planning horizon (adjusted for time value of the money), and combines them into a measure of NPV, IRR and breakeven year.

#### Net Present Value (NPV)

The net present value is the discounted value of the net return at the end of the planning horizon above what might have been gained by investing elsewhere at RRR. If NPV value is greater than Zero, the proposed project will earn a return on the investment greater than the net

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**Internal Rate of Return (IRR):** Is the discount rate at which the net present value of benefits equals the net present value of the cost. The IRR rule is to accept the project if it's  $IRR > RRR$  and to reject the project if it's  $IRR < RRR$ . (for the case study  $IRR = 19\%$ ).

**Break Even Year:** represents the amount of time that it takes for the project revenue to recover its initial cost. The scheme with quickest payback is preferred.

**Toll Rates:** The toll rates proposed after detailed analysis are as below.

Type of Vechile	Toll in Rs
Car/6s	15
LCV	20
Bus/Truck	35
MAV	40
Tractor	35

## V. CONCLUSIONS

Since the present traffic in the city was exceeding the capacity of existing road there was need to widen the road up to four lanes for the urban development. The project opted on BOT basis is valid because the economic evaluation shows that IRR for the road is 19% which is more than the required interest rate of 10% and NPV as well as benefit cost ratio was more than one that is positive.

## VI. REFERENCES

- [1] S K Khanna CEG Justo "Highway Engineering" Nem chand Bros. Rorkee, India, IX edition, pp. 159-211, 2011.
- [2] Kolhapur Municipal Corporation, Kolhapur City Integrated Road Development Project".
- [3] The Indian Road Congress "Guide lines for Traffic prediction on rural high ways" pp2-1996.
- [4] Esther Malini (1998) "Build Operate Transfer Municipal Bridge Project in India." Journal of Indian. Road Congress Vol.58, Issue187-123IRC.
- [5] Kumaraswamy Mohan M. (2001) "Procurement Protocols for Public-Private Partnered Projects" ASCE, Journal of Construction. Engg. & management., Volume 127, Issue 5, pp. 351-358.
- [6] Anathanarayanan K. (2003) "Risk factor & Management for BOT Road Project in India". Indian Highway Sector" Vol.31No.12 PP.53-75