A Dissertation Report

on

"Feasibility Analysis Of Highway Sector In India Through Comparative Analysis Of Concessionaire Models"

Submitted

in partial fulfillment of the requirements for the degree of

Master of Technology

in

Civil-Construction Management

by

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CERTIFICATE

This is to certify that, **Mr. Ketan Rangarao Patil (Roll No- 1727001)** has successfully completed the dissertation work and submitted dissertation report on "Feasibility Analysis Of Highway Sector In India Through Comparative Analysis Of Concessionaire Models" for the partial fulfilment of the requirement for the degree of Master of Technology in Construction Management from the Department of Civil Engineering , as per the rules and regulations of Rajaramb

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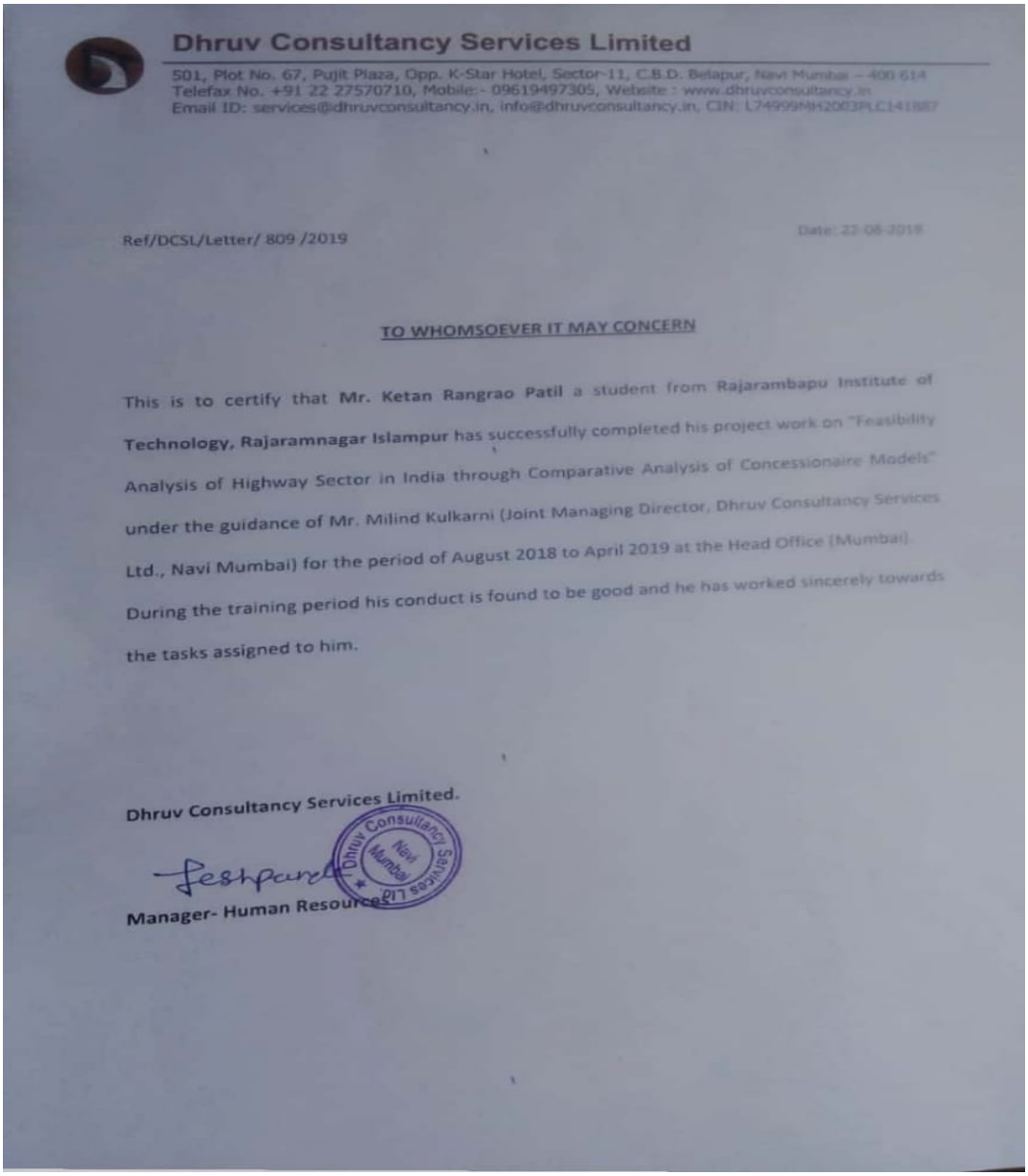

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This is to certify that **Mr. Ketan Rangrao Patil** a student from **Rajarambapu Institute of Technology, Rajaramnagar Islampur** has successfully completed his project work on "Feasibility Analysis of Highway Sector in India through Comparative Analysis of Concessionaire Models" under the guidance of Mr. Milind Kulkarni (Joint Managing Director, Dhruv Consultancy Services Ltd., Navi Mumbai) for the period of August 2018 to April 2019 at the Head Office (Mumbai). During the training period his conduct is found to be good and he has worked sincerely towards the tasks assigned to him.

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ABSTRACT

Investment in government infrastructure projects plays significant role in effective advancement and development of the country. However large scale highway development projects increases financial and budgetary burden on the government bodies. Therefore Public private Partnership (PPP) was referred which gives an opportunity to private sector to invest in infrastructure project. Interest of private sector to take part in investment of infrastructure projects rely upon financial and economic analysis of that project, which draws the viability in terms of benefits in near future as well as throughout the project lifecycle. This paper aims to study various concessionaire models available for financing a proposed national highway in India by carrying out the feasibility analysis of the project. It is necessary to compare all the models for highway project financing which will provide maximum returns on investment over a shortest period of time. Net Present Value (NPV) method of investment analysis is used where project will be compared in terms of present value of future returns, payback period and Internal Rate of Return (IRR) of the project. At the end through comparative analysis of concessionaire models, BOT annuity + VGF showed highest Internal Rate of Return 14.90% within concessionaire period of 30 years. .

Keywords: Public Private Partnership, NPV, IRR, BOT annuity, VGF.

Contents

List of Figures

List of Tables

ABBREVIATIONS

Ct	Cash flow at the end of year t
n	Life of the project
r	Discount rate
A	Annual Worth
P	Present Worth

Chapter 1

Introduction

1.1 Purpose

The economic growth because of economic liberalization in 1991 has given outcomes in the form of high traffic growth so to decongest roads there was a demand to improve the road system. The up gradation of Indian road network had gained most extreme significance in the later liberalization era, as the delay in road projects could conclude in high stock expense thus affecting India's aggressiveness in the worldwide market. Some changes were made after liberalization in the method of procurement in infrastructure projects basically highway projects. The state and central government adopted PPP instead of a public procurement process for a development of highway network. The main reasons authorities are using PPP's for infrastructure is to use skills, advancements and administrative ability of the private division to improve proficiency in projects. PPP also helps with an aim of using private cash inflows to fulfil the funding needs [1].

The framework fragment has transformed into most prominent focus zone of the government of India particularly highway advancement and development. In union budget of the year 2018-19, US $ 92.2 billion was assigned to this department [2]. Expanded energy to create infrastructure in the country is drawing both nearby local as well as worldwide players. In highway advancement section the organization's way to deal with extend private portion backing have shown assistance in the business with a huge number of private developers entering the business through open private association models. During next 5 years the investment with the help of PPP is expected to be US $ 31 billion. India has need

for investment of worth Rs 50 trillion and role of private sector participation has gained lot of importance to have sustainable development of country.

In India, the highway projects are either using one of the following models:

BOT (toll), BOT (annuity) and EPC (Engineering, procurement and construction) .Also the new advanced version of model concession agreement is introduced which is HAM (Hybrid annuity model) .In this research, study of these concessionaire models that are present in India is done. The selection of appropriate concessionaire model is crucial for successful completion of project. Concessionaire modelling plays a very important role in evaluation of projects for making project financing decisions by both the lenders and equity investors. In project finance, the funding agencies look into the expected future cash flows in relation to the amount of the initial investment while making the investment decision. Equity investors used financial model to evaluate the returns from the project in order to ascertain their adequacy. On the other hand, financial model is used by lenders to know the level of cover for their loans and the timeliness of project debt service payments.

The Net present value method (NPV Method) of investment analysis is utilized for selection of concessionaire model. NPV method used the concept of discounted cash flow analysis for the evaluation. The typical steps in discounted cash flow analysis involves: (1) future cash flows based on toll revenue; (2) determining the internal rate of rejoinder for discounting the cash flow; (3) computing the present value of the expected future cash flows; and (4) Compare whether the project is worth more than its cost. The numerous parameter required in NPV method were identified which are required for decision making of concessionaire. The comparative analysis for different concessionaire model was performed based on results obtained with NPV model. The simulation of parameters was developed over the concession period. The model was selected with maximum returns on investment over concession period. The model selected based on its feasibility analysis for a new highway project that will be undertaken.

Chapter 2

PRESENT THEORIES AND PRACTICE

2.1 Literature Review

Buen, O. and Mantilla.B.J.O., (2000) : PPPs for Road Development in Mexico

There is huge dependence on private investment as there are inadequate budget provisions by Mexico government. The changes in political scenario can have huge impact on the road infrastructure sector. The political risks are not covered in this research paper. The public sector is inefficient in managing the PPPs modelled project. The staff and personnel's of public sector do not get involved in planning these projects but only execution. Role of private consultants not included in the paper which can improve the project management in road infrastructure.

Singh, L.B. and Kalidindi, S.N., (2006): Traffic revenue risk management through annuity model of PPP road projects in India.

Government of India has been promoting involvement of private entrepreneurs in development of road projects in India through Public private Partnership (PPP). PPP brings in additional capital and imparts techno-managerial efficiency in the project development and operations. But lack of risk analysis has made private entrepreneurs reluctant for PPP. So there was a need to revamp the old BOT model and Annuity model was introduced. This paper objective to identify the risk involved in Annuity model.

Boeing Singh, L. and Kalidindi, S.N.,(2009): Criteria influencing debt funding of Indian PPP road undertaking : a case study.

PPP projects are characterized by highly leveraged capital structure. This paper mainly focuses on the risk and aspects of PPP road projects that lenders look into while making the decisions to extend project finance loans to PPP road projects. Loan specialists who give the significant bit of financing as an obligation and are progressively worried about the drawback dangers and the measures to alleviate the dangers. The case study research with the four Indian lending institutions is done and it helped in identifying the various aspects that they look into while making the credit decision.

Ashuri, B. and Mostaan, K., (2015): State of Private Financing in Development of HighwayProjects in the United States

The different strategies of private financing are used by different Departments of transports in U.S. which are studied by author. Accordingly it was found that private financing was considered to be instrument to fill gap of funding and financial shortfall but author suggest that private financing could be used as a solution to gain lifecycle cost efficiencies, encourage competition and transfer critical risk on private sector. The organizational policies, inefficient project development processes and nonflexible procurement method were major concerns of effective utilization of private finance. The research can help in accurate decision to engage in private financing in developing of highway projects.

El-Sayegh, S.M. and Mansour, M.H., (2015): Risk Assessment and Allocation in Highway Construction Projects in the UAE

The risk assessment mentions poor contract forms between government and contractor but there is lack of information on the financial models for infrastructure project. The dependability of infrastructure sector in UAE is on the oil prices. This aspect is not covered in risk assessment. UAE is number one in providing public infrastructure facilities. Therefore the competitions in contracts have increased over the years. This is forcing the contractors to lower tender prices in order to win work thereby eroding profit margins.

Ashuri, B. and Mostaan, K., (2016): Challenges and Enablers for Private Sector Involvement in Delivery of Highway Public–PrivatePartnerships in the United States

In this paper less focus is given on financial models for public private partnership. There is inadequate maintenance of roads in America because of failure to consider the true life cycle cost of maintaining and infrastructure asset over its entire expected life. More than 90% of revenues for infrastructure projects come from federal taxes on gasoline and diesel fuel. Inflation has reduced the purchasing power of these funds for maintenance and expansion of infrastructure projects. Hence better financial models need to be implemented considering above fact. There is advancement in technology in the private sector but lacks full public sector support.

Tokiwa,N.,Queiroz,C.,(2017): Guarantees and Other Support Options for PPP Road Projects: Mitigating the Perception of Risks.

The main aim of this paper is how financing can be effectively utilized in the preparation and implementation of PPP programs in highway development. In developing economies where public partner may not be sufficiently creditworthy in the eyes of private financers and may not be able to attract private investments without external support and role of private investment is must for development. So for successful implementation of PPP identification of risk is must. This paper includes identification of risks for each stage of the project and allocate responsibility for the identified risks between the public and private sector and mitigating that risk. Political risks and change in government policies in developing economies impacts infrastructure development to a great extent. So minimizing the impact and making PPP more attractive for sustainable development.

2.2 RESEARCH GAP

These studies just present the improvement techniques for existing models which are practice no new concept of financial model is introduced and more emphasis is given on BOT which is fully dependent on private financing. The Government fund available shall be considered while selection process of concessionaire model for implementation of project smoothly.

2.3 PROBLEM STATEMENT

The most important aspect which affects road construction is financing of that project. The project aims to study various concessionaire models available for

financing a proposed national highway in India by carrying feasibility analysis of a project. It is necessary to compare all the models available for highway financing which will provide maximum returns on investment over shortest period of time. So project aim in using NPV method of investment analysis where project will be compared in terms present value of future cash flow, internal rate of return and payback period of project.

2.4 OBJECTIVES

1) To study various concessionaire models available for highway projects.
2) To identify parameters or factors through case studies which are responsible for selection of concessionaire model for highway projects.
3) To do the feasibility analysis of a proposed Sinnar Palghar highway project.
4) Based on the results; recommend a suitable concessionaire model for the project.

Chapter 3

CONCESSIONAIRE MODELS

Introduction to Public Private Partnership (PPP) : Generally in India, the highway project were completely financed, controlled and managed by the Government. The execution of highway project was simply subject to the accessibility of assets, their allotment and discharge out of the financial limit of the Government [3]. As the maintenance and construction of roads requires huge cost, the government is not always in a position to allocate the require funds to the highway sector.

With a view to attract private investment in road development, maintenance and operation, National Highways Act (NH Act) 1956 was amended in June 1995. In the terms of the amendments made, the private sector can invest in the NH projects, levy collect and retain fee from the road users; they are also empowered to regulate traffic on such highways in terms of provisions of Motor Vehicle Act -1988.

Several incentives have been announced by the government to attract private sector participation and foreign direct investment. The schemes are called 'Public Private Partnership' or PPP schemes.

The incentives announced include the following:

1. Government to bear the cost of: a) project feasibility studies b) land for the right of way and way-side amenities c) shifting of utilities and environmental clearance, cutting of trees, etc.

2. Foreign direct investment up to 100% in road sector.

3. 100% tax exemption in any consecutive 10 years out of 20 years after commissioning of the project.

4. Duty-free import of high capacity and modern road construction equipment.
5. Declaration of road sector as an industry .
6. Easier external commercial adoption norm.
7. Right to retain the price; further toll rates can be revised based on the wholesale damage index.

Types of public private partnership a. Design, Build, Finance, Operate and Transfer (DBFOT) – on toll basis b. Design, Build, Finance, Operate and Transfer (DBFOT) – on annuity basis c. Special Purpose Vehicle (SPV) basis d. Engineering, Procurement and Construction e. Hybrid annuity Model

DBFOT-Toll model

In a DBFOT- Toll model, the company which undertakes the project or the 'Concessionaire's required to meet all the costs including, construction, maintenance and operation till the end of concession period; the concessionaire is allowed to collect the prescribed toll during the concession period. The concessionaire recovers the entire upfront cost along with the interest and a return on investment out of the future toll collection. In this model, the risk of traffic variation is to be absorbed by the concessionaire.

DBFOT-Annuity model

In a DBFOT- Annuity model, the concessionaire is required to meet all the price including construction and maintenance till the end of the concession stop; operation is done by the administration and the concessionaire is paid a predetermined price of return, out of the annuity payable by the guest / administration. The tolling is done by the administration. In this model, the risk of traffic mutation is absorbed by the regime by the government or the client.

Special purpose vehicle In some types, the government may from a 'Special Purpose Vehicle' (SPV) and implement the projection under the commercial format. The SPV involves the government section, the financial institutions and the concessionaire or the benefactive role formation. In this case the quantity spent on maturation of main road will be recovered in prescribed concession period by

way of collection of bell by SPV.

Engineering, procurement and construction model:

The EPC contractor (EPCC) agrees to deliver EPC, which is an acronym that stands for engineering, procurement and construction. It is a common form of contracting arrangement within the construction industry. Under an EPC contract, the contractor designs the installation, procures the necessary materials and builds the project, either directly or by subcontracting part of the work [4]. In some cases, the contractor carries the project risk for schedule as well as budget in return for a fixed price, called lump sum or LSTK depending on the agreed scope of work.

Need of EPC Model

• Current growth scenario cannot support big highway projects typically developed in the PPP mode.

• There are no private equity funds which are willing to come in at this moment to take up these projects.

• Thirdly, there are no developments regarding many provisions which NHAI has proposed to improve financing conditions. Hence, NHAI now believes that projects can only be developed through the engineering, procurement and construction (EPC) mode.

Advantages of EPC Model

Together with the Schedules, the proposed framework of the Model EPC Agreement incorporates international best practices and embodies an enabling contractual framework for mental synthesis of highways in an efficient, economical and competitive environment. It will minimise, if not eliminate, the clock time and cost over-runs characteristic of the extant item rate contracts. Further, this will enable a faster roll-out of projects with least costs and greater efficiency while minimizing the potency for excessive discretion.

Hybrid annuity model

As the name suggests, HAM's a hybrid — a mix of the EPC (engineering, procurement and construction) and bot (build, operate, transfer) models. Under the

EPC model, NHAI pays private players to lay roads. The private player has no role in the road's ownership, toll collection or maintenance (it is taken care of by the government). Under the bot model though, private players have an active role — they build, operate and maintain the road for a specified number of years — say 10-15 years — before transferring the asset back to the government.

Now, HAM combines EPC (40 per cent) and bot-annuity (60 per cent). On behalf of the government, NHAI releases 40 per cent of the total project cost. It is given in five tranches linked to milestones. The balance 60 per cent is arranged by the developer. Here, the developer usually invests not more than 20-25 per cent of the project cost (as against 40 percent or more before), while the remaining is raised as debt.

In last decade, many variants of PPP were experimented. Commonly adopted models were BOT with toll and BOT with annuity. Some early projects were awarded with success, mainly connecting important cities with steady and growing traffic.

But soon it was clear that in some road segments may not have adequate toll paying traffic thus requiring partial government support. This was achieved through offering Viability Gap Funding (VGF) from 20% to 40% of project cost and the Contractor asking for minimum VGF Grant could get the project.

While experimenting with this VGF model, Government realized that some road connecting important cities had good prospects of collecting toll more than required for recovery of investment including interest and profits. This resulted into negative grant i.e. Contractors were willing to give money to government for awarding the project and those paying highest grant to government could get project awarded to them. More than 10-12 projects were awarded on these lines, perhaps due to over-enthusiasm of Contractors to get the projects. But soon it was clear that reality was not rosy and Contractors started backing out of project, by returning the concession granted to them.

Still there were few projects in remote areas, which were not commercially viable due to their poor toll collection prospects. For such projects government decided to offer 100% support, by annuity payment over the concession period and the Contractor asking for lowest annuity was awarded project without toll collection responsibility. This idea was well received due to assured annuity without

the responsibility of collecting toll. But soon Government felt that such annuity payment for large number of projects will create a permanent burden of annuity payout in all future budget and they decided to discontinue with this model unless very essential in rare cases. Hence all these combinations of payment arrangement needed a relook, as many of these were not working well and contractor stopped quoting for new BOT projects, due to various risks they were facing in the previously awarded projects.

Chapter 4

CASE STUDIES OF VARIOUS CONCESSIONAIRE MODELS

4.1 CASE STUDY 1

a) Karad – Tasgaon – Jath – Vijapurupto Karnataka border (LENGTH – 153 KMS)

b) **Nagaj Junction at NH-166 to Jath (LENGTH – 32 KMS)**

About the project

The project road passes through two districts of Maharashtra Satara and Sangli. It is total length of 182 km (design length). The project site starts from Karad Km 0/000 and ends at Karnataka Border near Vijapur Km 149/040 and from Nagaj Km 0/000 to at Jath Km 31/554. The road crosses the Krishna River, Yerala River and Agrani River and passes through villages like Karave, Shenoli, Dudhari, Takari, Kundal, Palus, Turchi, Tasgaon, Manerajuri, Borgaon, Shirdhon, Kavatemhankal, Kokale, Dapalapur, Jath, Nagaj, Chorochi, Birnal, Muchundi, etc.

Geographical location

The project passes primarily through plain and rolling terrain. The alignment is single carriageway comprising two lanes with width ranging from 5 m to 10 m and earthen shoulder on either side. The alignment is generally straight with reasonably large radii curves that are generally appropriate for high speeds. The highway passes through rural agricultural areas and villages, such as Karad, Karve,

Wadgaon, Shenoli, Bhavaninagar, Rethore, Dudhari, Takari, Tupari, Kundal, Palus, Tasgoan, Manerajuri, Borgaon, Shirdhon, Kavatemhankal, Kokale, Dapalapur, Nagaj, Dharneshwar, Nimaj, KadamwadiPhata, Chorchi, Kumbhari, Birnal, Jath, Muchandiupto State border. The adjoining land use is predominantly barren with patches of agricultural land, forest. The highway passes through towns and many villages some of which have settlements in close proximity of the highway.

Socio Economic Aspect

The sugar factory was a landmark in the history of industrialisation of the district. Two electricity generation plants were established in 1933 and 1940, respectively. The other industries like extraction of edible oil, copper and brass rolling and general engineering came into existence after India became politically free. The Cooper Engineering Works at Satara Road have established a countrywide reputation for the manufacture of engines, spare parts, machine tools, power looms and agricultural implements.

Koyana Electric Grid

The Koyna Electric Grid Scheme is a unique feature of the district. It is one of the biggest hydroelectric projects in Maharashtra. It will encourage industrial growth and rural electrification in the areas. The programme of rural electrification forms an integral part of the Koyna Scheme. The project is estimated to generate about 5, 00,000 k.w. power on completion. Under this scheme it is proposed to construct the following major transmission lines from Koyna Power House to Karad, Satara Road and Vishrambag. It will serve Satara, Panchgani, Wai,Mahabaleshwar, Karad and Satara Road.

Industries in Sangli

The industrial landscape of the region locates around the Sangli and Miraj and its suburbs. In the region five sugar factories that is VasantdadaPatilShetkari Co-operative, Sugar Factory (Sangli), ShriMahakali Sugar Factory (KavatheMahankal), Yashwant Co-operative Sugar Factory (Khanapur), Tasgaon and Jat Sugar Factory.RajaramBapu Sugar, Hutatma Sugar, Sarvoday Sugar in Walwataluka. FateshingNaika in Shiralataluka. They have tremendously proved suc-

cessful in changing the economy.

Tourist place in Satara and Sangli

Famous tourist places in Satara are PreetiSangam (Confluence of Koyna and Krishna River), Pratapgad fort, Kaas plateau, Sajjangadfort,Thoseghar Waterfall Famous tourist places nearby Sangli city are Gokak Water Falls, Sagareshwar Wild Life Sanctuary, Dandoba Hill Station, Chandoli Forests, Audumbar, Mahabaleshwar, Bahuballi Hill Temples (Kumbhojgiri), Pandharpur.

To enhance project benefits for roadside communities and road users, the project design has incorporated the following:-

1. Improvement of geometric deficiencies.
2. Provision of underpass that carry pedestrian walkways, cart track, villages and other roads.
3. Separate provision of Service Roads
4. Separate provision of footpaths
5. Provision of anti- crash barriers
6. Effective surface and subsurface drainage system to ensure that there shall be no pooling of water on the highway and the adjacent area.
7. Safety measures such as pedestrian rail, barriers, highway signs, pavement marking, traffic signals, landscaping, illumination, road furniture, truck lay – bays and bus-bays
8. Addition of truck parking for improved road safety and reduced road congestion.
9. Saving in vehicle operating cost.
10. Time saving – freight and passenger movement.
11. Lower accidents, quick access to services

Socio economic benefit

Government will contribute to the substantial, financial, and social benefits to country by upgradation of the strategic state highways to National Highways. This project will propel the:-

1. Overall transport capability all over the country.

2. Journey speed on the highways will increase where there will be substantial savings in terms of vehicle operating cost and time.
3. The project will lead to reduction in road congestion, improvement of road side drainage condition, especially in the urban sections of the road.
4. A major contribution of the project will be towards the increase the safety levels (i.e. reduction in propensity to have accidents), for both pedestrian as well as motorist.
5. The project will facilitate higher accessibility to the large part of the state and will relive several bottlenecks to development.
6. The project provided amenities like access roads, parking lanes. 7. Bus stops, bus bays.
8. Improved storm water drainage in urban stretches.
9. Demarcated pedestrian road crossing areas.
10. Sign boards for safety provisions at schools, hospitals, petrol pumps, etc.
Below Table no shows 4.1 Summary of Tasgaon Shirdhon case study

Table 4.1: Summary of Tasgaon Shirdhon case study

Tasgaon-Shirdhon	Cost	900-1100 crores	EPC
	PCU	4000 to12000 PCU	
	IRR	IRR 12%	
	EIRR	27.47%	
	Terrain type	Plain and rolling terrain	
	Pavement type	Rigid	

4.2 CASE STUDY 2: Four lanning of Sinnar to Shirdi section of NH 160

About the project The project highway is a two lane State Highway (SH39) is being used extensively for traffic originating from Nashik, Mumbai, Surat (Gujarat), Andhra Pradesh for famous pilgrimage of ShriSai Baba of Shirdi located in Ahmednagar District. The existing highway is 2 laned and has varying contours

with sharp turns and passes through a number of intersections without clear sight distance and adequate acceleration/de-acceleration approaches. With increased traffic load and improved vehicle design, the road conditions call for re-look and same is required to be upgraded to 4 lanes as per stipulated standards of Ministry of Road Transport and Highways.

Geographical location The terrain along the project length is plain terrain.There is a mixed land use along the project highway. As there is MIDC at Musalagaon, the section of road along Musalgaon road is under industrial zone. Some of the area is barren land. Most of the part is under agriculture zone. The area at major towns such as Sinnar, Pangri, Vavi is built up zone.

Socio Economic Aspects

Pilgrimage:-

Shirdi is found around 296 km from Mumbai, capital of Maharashtra in India. It is called the Land of Sai. The closest and most highly connected city from Shirdi is Ahmednagar city. Shirdi being a pilgrimage centre, it similarly has a great deal of skimming people. On any given day, some 25,000 devotees come for Darshan. On holidays, the number reaches to about 5 lakhs. Buses and taxis ply from these railway stations and locations to and from Shirdi. Shirdi can be reached by bus from any of the following cities in Maharashtra State (India): Nagpur, Dhule, Nashik, Thane, Pune, Mumbai, Ahemadnagar. Also from Hyderabad, Andhra Pradesh from where maximum pilgrims reach every day and year to seek blessings from Sai Baba.

There are two routes from Sinnar to Shirdi

1. Sinnar-Shirdi via NH160 Length 60km (time required 1hour 7mins)
2. via NH 50 and NandurShingote – Loni , State length-64.6Km (Time required-1Hour 23mins)

The best route to choose is via NH160. In addition, this is the shortest route from Nashik to Shirdi. Hence, there is traffic on this road.

Also on the occasion of Ram Navami generally in the month of March every year, about 25000 pilgrims from different parts of India use to come for Darshan at Shirdi travel on this road by walk. At that time road user vehicles often faces traffic congestion problems. Besides main festival days, in normal days too a sub-

stantial number of people/ pilgrim walk the stretch on bare feet almost daily for Sai Temple Darshan. This fact needs to be considered while designing the improvement scheme of the project road in order to avoid such traffic congestion/accidents.

Industries

The industrial area is situated at Musalgaon at km 62/600. Also proposed five stars MIDC at Sinnar will cover this Sinnar to Shirdi section in future. The first phase of the works of this MIDC would start on the Sinnar – Shirdi highway (Ghoti – Sinnar – Aurangabad by-pass national express highway). The proposed Five Star MIDC would have many Infrastructural facilities like Air-cargo, Power generation project, Railway link, express highways and other facilities to support the project.

Some additional benefit

• Feeder road for Proposed Nagpur-Mumbai Communication Super Expressway Corridor

• Palkhi Marg in 5.50 m of rigid pavement

Socio economic benefit

1. Fast and safe connectivity resulting in savings in fuel, travel time and total transportation cost to the society
2. Development of quality to existing tourism and pilgrimage
3. Reduction in accidents and pollution
4. Reduction in traffic congestion
5. Development in Industrial sector because of safe and fast transportation facilities
6. Better connectivity between two national highways i.e. NH50 and proposed national highway (existing SH-10)

Table no 4.2 shows Summary of Shirdi Sinner case study

Table 4.2: Summary of Shirdi Sinner case study

Shirdi-Sinner	Cost	800-1000 crores	HAM
	PCU	18000 to 30000 PCU	
	IRR	11.59%	
	EIRR	32.56%	
	Terrain type	Plain	
	Pavement type	Rigid	

4.3 CASE STUDY 3: Capacity Augmentation and value addition works on Yashwantrao Chavan Expressway (YCEW) including Construction of missing link of Expressway in the state of Maharashtra

The Mumbai Pune Expressway is presently of 6-lane cement concrete pavement with 2.5m wide paved shoulder on both sides having a length of 94 kms. National Highway No. 4 from ShilPhata to Dehu Road is a 4-lane bituminous pavement with a length of 111 kms.

Mumbai-Pune Expressway and NH-4 meet near Khalapur Toll Plaza and separate near Khandala exit. The section from Adoshi Tunnel to Khandala exit is a 6-lane road but the traffic of 10-lane road (6-lane of Mumbai-Pune Expressway + 4-lane of NH-4) is plying in this section. Heavy amount of traffic and landslides causes congestion in this stretch. Due to decrease in speed and increase in time of travel in this section and in order to save time, vehicles move at a faster speed on rest of the expressway which has resulted in increase in number of accidents. A small piece of image is called a patch. The original image size is 240240 so, we are dividing our image into the matrix format. We figure out what parts of an image are highlighted, like special patches that can uniquely describe the image.

In 1995, M/s. RITES had carried out feasibility studies for the Mumbai-Pune Expressway and has suggested an alternate route for this Ghat Section. MSRDC had appointed a Technical Advisory Committee in order to review the Detailed Project Report submitted by Consultant.

Accordingly, as per suggestions of Technical Advisory Committee alignment of the Missing Link along with Detailed Project Report approved by Technical Advisory Committee.

The length of existing Mumbai Pune Expressway section from Khopoli exit to Sinhgad Institute is presently 19 kms. This distance will be reduced to 13.3 kms after construction of this new missing link. So, the total length of Expressway from Mumbai to Pune will be decreased by 6kms. Travel time will be reduced by 20-25 mins.

The proposal is as follows:
1. Construction of missing link of MPEW from Adoshi tunnel to Kusgaon as a part of Capacity Augmentation of MPEW with 8 lane new alignment for about 12 Km length.
2. Capacity Augmentation (Eight Laning) of existing MPEW including widening of all overpasses and under passes to ten lanes.
3. Capacity Augmentation (Six Laning) of existing NH4 with service roads, underpasses, foot over bridges and flyovers where ever required.
4. Four laning of all connectors between MPEW and NH4
5. Four laning of NH4 stretch from Dehu road to Nigadi which will act as connector to PCMC area.

Social economic Aspects

Mumbai-

Mumbai is the vibrant and pulsating capital of Maharashtra. It is the second largest city of India having a population of 12 million and is considered as the commercial capital as well as economic centre of the country. Mumbai, the core of industrial and financial development, is a commercial hub of India with cotton mills, synthetic textile mill, and chemical and petroleum-based industries located in and around the city.

Its economic activities are development and concentrated in its southern island, which is narrow a north south axis and has area of only 69 sq.km while Greater Mumbai has 438 sq.km area and MMR has an area of 4164 sq.km. Thus, the

intensity of employment in the island city resulted in a reduction of residential population through the process of residential building being converted into commercial ones. Since the main transport generation has been that of movement between home and work site, the Mumbai Island has been major nodal centre to traffic. To reach this nodal centre from the area outside the island city, there are three expressways constructed connecting to Mumbai city one of which is Sion-Panvel highway connecting to Mumbai to Mumbai Pune Expressway.

Recently Navi Mumbai Airport has got clearance from MOEF is likely to be operational by 2014. The new Airport will increase the traffic from Pune to Navi Mumbai. MTHL and Chakan Airport projects are also on cards which will further add to traffic on Mumbai Pune corridor. Navi Mumbai Special Economic Zone (NMSEZ) a joint venture project of CIDCO is also coming up in near future demanding additional road network.

It is India's principal, financial, commercial, communication and transport centre. The city has the country's largest busiest port, handling more than 46% of India's total foreign trade. Mumbai has also been the first choice of the private entrepreneur. It is a city of tall sky scrapers kissing the sky.

There are ambitious plans of JNPT port development in next 10 years. The new port at Dighi in Raigad district is being commissioned in next 6 months which is only 50 km away from MP corridor.

Industries

Mumbai has huge range of various businesses. However, textiles are still Mumbai's largest industry. Some of the other industries that Mumbai has include: Pharmaceuticals, construction, engineering, metals, silks, glassware, printing, plastics, bikes and flims. It also has a large petroleum industry. Nearly all of India's petroleum is marketed in Mumbai. Today Mumbai accounts for 20% of India's total employment industry and 11% of India's employment in total. It handles 30% of India's exports and imports and is the subcontinent's largest port. However, there is extremely high rate of unemployment due to the fact that there are severely fewer jobs than there are workers.

Economy

Mumbai, is the commercial capital of India, contributing 10% of factory employment, 33% of income tax collections, 60% of customs duty collections, 20% of central excise tax collections, 40% of India's foreign trade and rupees 40,000 corer in corporate taxes. Headquaters of a number of Indian financial institutions such as Bombay Stock Exchange, Reserve Bank of India, National Stock Exchange, the mint as well as numerous Indian companies such as TATA group Vedanta Resources and Reliance are located in Mumbai. Most of these are located in downtown South Mumbai which is the nerve centre of the Indian economy. Many foreign establishments also have their branches in the South Bombay area.

Pune–

Pune has been known by a plethora of sobriquets. Popular among them: Queen of the Deccan, cultural capital of Maharashtra, pensioner's paradise and Oxford of the east. Pune is one of the historical cities in India with glorious past, and innovative present and promising future. The boundaries extent over four hundred square kilometres and it has a population of close to four million. Thus Pune city has been developed into a Pune metropolitan area, just equal in area to that of Greater Mumbai.

Industries- The emergence of industrial Pune began in the early 60s, with mechanical engineering industries putting up the base. Pune's proximity to Mumbai, good climate and availability of talent made it a preferred destinations to large firms like Tata Motors, (TELCO then), Buckau Wolf (Thyssen Krupp now), Hindustan Antibiotics and several others.

Today Pune has a diverse industrial population. It is one of India's most important automotive hubs, with some domestic and international auto giants, manufacturing here. Pune also has hundreds of large and small IT companies. Hinjewadi in Pune is growing one of the big IT hub in the country.

Socio economic benefit

The advantages of new alignment are:

1. Distance saving for Mumbai to Pune by 8.60 Km.

2. Travel time saving 24 minutes

3. Minimum or negligible forest land requirement.

4. No widening is required in Ghat length of MPEW which will ensure smooth flow of traffic during construction.

5. No deforestation/tree cutting in echo sensitive Ghat length as there will not be widening in this length.

6. Smooth gradients.

7. No fear of rock falls.

8. Less pollution from vehicles which are presently travelling in ghat length in lower gear and less speed

9. Reduced Accidents

10. No traffic jams and snarls

11. Road users will get 6 lane facility for NH4 and 8 lane facility for MPEW without enhancing the present notified toll rates.

Table no 4.3 shows Summary of Mumbai Pune case study

Table 4.3: Summary of Mumbai Pune case study

Mumbai –Pune	Cost	5000-6000 crores	BOT
	PCU	PCU ¿40000	
	IRR	12.50%	
	EIRR	31.92%	
	Terrain type	Plain and hilly	
	Pavement type	Rigid	

Chapter 5

ROAD INVESTMENT DECISION MAKING PARAMETER

The various parameters for decision making are as follows:

1. Net present value (NPV)
2. Internal rate of return (IRR)
3. Viability Gap funding (VGF)
4. Payback Period

1) Net Present Value (NPV) –

NPV is used for capital budgeting and planning for the investment to analyse the profitability of the project.Net present value (NPV) of a project is the sum of the present values of all cash flows positives as well as negative that is expected to occur over the life of the project.

NPV of project $=\left(\frac{Ct}{(1+t)2}\right)$

Ct is the cash flow at the end of year t, n is the life of the project and r is the discount rate. The NPV represents the benefit above and over the compensation for time and risk. Hence decision rule associated with the net present value criterion is accept the project which is having positive NPV and reject the project which is having negative NPV.

2) Internal rate of return (IRR) –

Internal rate of return of a project is the discount rate which makes its NPV equal to zero. Put differently, it is the discount rate which equates the present value of future cash flows with the initial investment. It is the value of r in the following equation.

Investment $= \left(\frac{Ct}{(1+t)2}\right)$

In the NPV calculation we assume that the discount rate (cost of capital) is known to determine the NPV. In the IRR calculation we set the NPV equal to zero and determine the discount rate that satisfies this condition.

Generally speaking, the higher a project IRR, the more desirable is to undertake the project.

IRR represents the time adjusted earnings over project life. It is that rate that equates the present value of cash inflows to the present value of cash outflows of the project [5]. Or in other words, the discount rate that set sets NPV of cash flows to zero. Direct cost of project and benefits are calculated by investor's point of view in IRR.

3) **Viability Gap Funding (VGF) –**

Reasonability hole subsidizing suggests one time grant or award, provided for assistance framework ventures which are monetarily appropriate yet come up short of budgetary practicality. The absence of budgetary suitability for the most part develops because of long development periods and the powerlessness to expand client dashes into business levels [6]. Framework venture in like manner incorporate various externalities which are not adequately covered in direct budgetary comes back to the undertaking support. Through this arrangement of a catalytic grant assistance of the capital cost, several projects may become viable financially and it will help to mobilise private investment in infrastructure.

Government of India has notified a scheme for viability gap funding to infrastructure projects that are to be undertaken through public private partnership. It is plan scheme that will be administered by the ministry of finance with a suitable budgetary provision to be made in annual plans on a year to year basis. The quantum of VGF provided under this scheme is in the form of capital grant at the stage of project construction.

Support under this scheme is available for only infrastructure projects where private sector sponsors are selected through a process of competitive bidding. The venture understanding must in like manner stick to best practices that would verify an incentive for open cash and secure the client premium. The lead budgetary association for the undertaking is accountable for checking to watch and intermittent assessment of the task with a concurred exhibition and achievements especially with the end goal of award payment. VGF is disbursed only after the private sector company has subscribed and expended the equity contribution for the project.

Designation of Cess Revenues for Viability Gap Funding

The average viability gap funding has been assumed as 30% of the project cost. The maximum in selected cases can go up to 40% of the project cost.

Allocation of cess revenues by the Government for funding the annual plan outlays of NHAI may be split into two parts viz. (a) PPP component, and (b) EPC, O and M and Misc. component. These two components may be treated on the following lines:

(a) A part of the cess revenues from 2006-07 onwards may be designated as fund and put under a separate budget head for PPP to be used only for meeting the viability gap requirements of BOT (Toll) projects. The earmarking would be done annually by the Planning Commission in consultation with MoSRTH, and Finance Ministry, along with fixing of the borrowing limits of NHAI. For meeting any gaps in funding, short-term or medium-term borrowings may be allowed subject to overall borrowing limits of NHAI.

(b) The remaining cess revenues along with toll revenues and committed external aid may be used for funding CC, O and M, establishment expenditure, land acquisition, DPRs, feasibility studies etc. For meeting any shortfalls under this head, NHAI may raise market borrowings that should be serviced out of future revenues under this head.

4) Payback period:

The restitution time frame is the timeframe required to recover the basic cash cost on the undertaking. For example, if a project involves a cash outlay of Rs 800,000

and generates cash inflows of Rs 1,00,000 , Rs 2,00,000, Rs 2,00,000 , Rs 3,00,000 in the first, second , third and fourth years, respectively, it payback period is 4 years because the sum of cash inflows during 4 years is equal to initial outlay which was invested. If the annual cash inflow is a constant sum, the payback period is simply the initial outlay divided by annual cash inflow.

According to payback criterion, the shorter the payback period, the more desirable is the project. Firms using this criterion generally specify the maximum acceptable payback period. If this is n years, projects with payback period n or less are deemed worthwhile and projects with payback period exceeding n years are considered unworthy.

Following are the advantages:

1) It is simple, both in concept and application. It does not have tedious calculation.

2) It is rough and ready method in dealing risk.

3) Since it emphasises on earlier cash flows, it may be a sensible criterion when firm is pressed with problems of liquidity.

4) It favours projects which generate substantial cash inflows in earlier years and discriminates against projects which bring substantial cash inflows in later years but not in earlier years. Now, if risk tends to increase with futurity- in general, this may be true- the payback period maybe helpful in weeding out risky projects.

Chapter 6

TRAFFIC VOLUME AND TOLL REVENUE

6.1 Traffic volume

Traffic flow or volume is measured in terms of number of vehicles per unit time. The common units of time are day and hour. Thus the flows are measured in terms of vehicles per day or vehicles per hour. Daily traffic volume is denoted by the term ADT or AADT. ADT (Average Daily Traffic) is the value when traffic counts are taken for a limited period of say 3-7 days, and the daily average determined. AADT (Annual Average Daily Traffic) is the value when traffic counts are taken for all the 365 days of the year and the daily average determined 7.
Since Indian traffic is heterogeneous, the traffic is converted in terms of passenger car units (PCUs) shown in Table no 6.1. The result of the presence of slow moving vehicles in traffic stream is that it affects the free flow of traffic. A way of accounting for the interaction of various kinds of vehicles is to express the capacity of roads in terms of a common unit. The unit generally employed is the 'passenger car unit'. The values of passenger car equivalency for different vehicles types are given in IRC: 64- 1990.

Traffic volume data for Project shown in Table no 6.1 . The annual average daily traffic volume is collected and increased for traffic growth by 5% each years as per guidelines given in "Financing Plan of National Highways".

Table 6.1: Passenger Car Unit

Vehicle type	**Equivalence factor**
Fast Vehicles	
1. Motor Cycle or Scooter	0.5
2. Passenger Car, Pick-up Van or Auto-rickshaw	1
3. Agricultural Tractor, Light Commercial Vehicle	1.5
4. Truck or Bus	3
5. Truck-trailer, Agricultural Tractor-trailer	4.5
Slow Vehicles	
6. Cycle	0.5
7. Cycle-rickshaw	2
8. Hand Cart	3

Table 6.2: Traffic volume data for Project

Type of Vehicle	**2 Wheeler**	**3 Wheeler**	**Car / Jeep**	**LCV**	**Mini Bus**
PCU factors	0.5	1	1	1.5	1.5
Growth for existing Traffic	5.0%	5.0%	5.0%	5.0%	5.0%
Growth for proposed Traffic	5.0%	5.0%	5.0%	5.0%	5.0%
AADT	**3380**	**1211**	**267**	**251**	**320**

Trucks (2 Axle)	**Private Bus**	**Govt. Bus**	**Trucks (3-Axle)**	**MAV**	**Total**
PCU factors	3	3	3	3	4.5
Growth for existing Traffic	5.0%	5.0%	5.0%	5.0%	5.0%
Growth for proposed Traffic	5.0%	5.0%	5.0%	5.0%	5.0%
AADT 55	**85**	**180**	**195**	**280**	**3380**

6.2 Toll revenue

WPI termed as whole sale price index is an index that track and measures the changes in the price of goods before the retail level (Retail level is level in which goods are sold in bulk and traded between business instead of consumers). WPI is expressed in percentages of ratio given in below mentioned Table no 6.3 . It indicates average change in price which is seen as an indicator of country's inflation level.

WPI reports are generated monthly to show average change in price. The comparison is done on total cost of goods in current year to total cost of goods in base year. For e.g. imagine 2012 as a base year, if total price of good is Rs 3300 and 4000 in 2017 so the WPI for 2017 with base year of 2012 in 116(4000-3300=700, 700 divide by 6 years is equal to 116, indicates increase of WPI by 16%

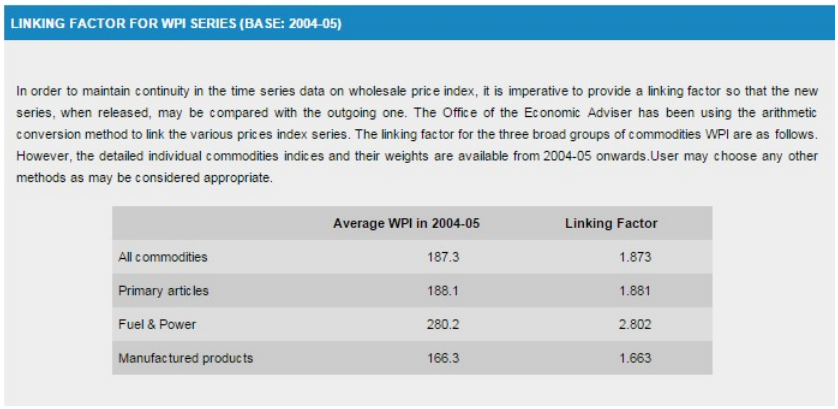
WPI usually takes into account the commodity prices but the products which are included vary from country to country. Some small countries compare 100 to 200 products while large industrial countries like UK and US compare thousands of products in WPI. the Linking Factor for project shown in fig no 6.1

Table 6.3: WPI for Project for toll revenue calculation

	Average WPI 2004-5 Collected from office of economic advisor run by Ministry of commerce and industry		
Year		Linking factor	WPI January
Jan-07	116.7	1.873	**208.7**
Jan-08	124.50	1.873	218.58
Jan-09	133.4	1.873	233.19
Jan-10	146	1.873	249.86
Jan-11	157.3	1.873	273.46
Jan-12	168.8	1.873	294.62
Jan-13	179.6	1.873	316.16
Jan-14	**178.7**	1.873	336.39
Jan-15	176.8	1.873	334.71
Jan-16	182.8	1.873	326.29
Jan-17	116.7	1.873	335.94
Jan-19	Increase by 5 %		373.6
Jan-20	Increase by 5 %		392.3
Jan-21	Increase by 5 %		411.9
Jan-22	Increase by 5 %		432.5
Jan-23	Increase by 5 %		454.1
Jan-24	Increase by 5 %		476.8
Jan-25	Increase by 5 %		500.6
Jan-26	Increase by 5 %		525.6
Jan-27	Increase by 5 %		551.9
Jan-28	Increase by 5 %		579.5
Dec-28	Increase by 5 %		608.5
Dec-29	Increase by 5 %		638.9
Dec-30	Increase by 5 %		670.8
Dec-31	Increase by 5 %		704.3
Dec-32	Increase by 5 %		739.5
Dec-33	Increase by 5 %		776.5
Dec-34	Increase by 5 %		815.3
Dec-35	Increase by 5 %		856.1
Dec-36	Increase by 5 %		898.9
Dec-37	Increase by 5 %		943.8
Dec-38	Increase by 5 %		991
Dec-39	Increase by 5 %		1040.6
Dec-40	Increase by 5 %		1092.6
Dec-41	Increase by 5 %		1147.2

Table 6.4: WPI for Project for toll revenue calculation

Year		Linking factor	WPI January
Dec-42	Increase by 5 %		1204.6
Dec-43	Increase by 5 %		1264.8
Dec-44	Increase by 5 %		1328
Dec-45	Increase by 5 %		1394.4
Dec-46	Increase by 5 %		1464.1
Dec-47	Increase by 5 %		1537.3
Dec-48	Increase by 5 %		1614.2
Dec-49	Increase by 5 %		1694.9
Dec-50	Increase by 5 %		1779.6
Dec-51	Increase by 5 %		1868.6



LINKING FACTOR FOR WPI SERIES (BASE: 2004-05)

In order to maintain continuity in the time series data on wholesale price index, it is imperative to provide a linking factor so that the new series, when released, may be compared with the outgoing one. The Office of the Economic Adviser has been using the arithmetic conversion method to link the various prices index series. The linking factor for the three broad groups of commodities WPI are as follows. However, the detailed individual commodities indices and their weights are available from 2004-05 onwards.User may choose any other methods as may be considered appropriate.

	Average WPI in 2004-05	Linking Factor
All commodities	187.3	1.873
Primary articles	188.1	1.881
Fuel & Power	280.2	2.802
Manufactured products	166.3	1.663

Figure 6.1: Liknking Factor

The base rate for different class of vehicles has been listed below Table no 6.5 (As per NHAI norm):

Table 6.5: The Base Rate For Different Class Of Vehicles

Year Year	**Car, Jeep, Van or LMV**	**LCV, LGV, Mini bus**	**Truck, Bus Truck, Bus**	**3 Axle 3 Axle**	**4 to 6 axle / HCM**	**O/S vehicles**
Base Rate	0.65	1.05	2.2	2.4	3.45	4.2

The base rate is increased by 3% for every year. The toll rate evaluation is evaluated as per guidelines given in "The Gazette of India" part 2 section 3 sub section 1.

Example for evaluating Toll rates is given below:

If base rate for 2008-09 for car, jeep and van is 0.6695, and WPI for 2007 is 208.70 and for 2008 is 218.58, then base rate for toll fee working is calculated as below:

$$\left(\frac{(Baserate2008-09)+(Baserate2008-09)*(WPI2008-WPI2007)}{WPI2007}\right)*4$$

The toll rates shown in table are calculated using the above formula

The calculated toll rates are shown in Table no 6.6

& Toll revenue over concession period is shown in Table no 6.2

Table 6.6: The Toll Rates Calculated Over Period Of 30 Years

Year	**Car, Jeep, Van or LMV**	**LCV, LGV, Mini bus**	**Truck, Bus Truck, Bus**	**3 Axle 3 Axle**	**4 to 6 axle / HCM**	**O/S vehicles**
2015 - 16	55	85	180	195	280	55
2016-17	55	85	180	200	285	55
2017-18	55	90	190	205	295	55
2018-19	60	95	200	215	310	60
2019-20	60	100	210	230	330	60
2020-21	65	105	220	240	345	65
2021-22	70	110	230	250	360	70
2022-23	70	115	240	265	380	70
2023-24	75	120	255	275	400	75
2024-25	80	125	265	290	420	80
2025-26	85	135	280	305	440	85
2026-27	85	140	295	320	460	85
2027-28	90	150	310	340	485	90
2028-29	95	155	325	355	510	95
2029-30	100	165	340	375	535	100
2030-31	105	170	360	395	565	105
2031-32	110	180	380	415	595	110
2032-33	120	190	400	435	625	120
2033-34	125	200	420	455	655	125
2034-35	130	210	440	480	690	130
2035-36	135	220	465	505	730	135
2036-37	145	235	490	535	765	145
2037-38	150	245	515	560	810	150
2038-39	160	260	545	590	850	160
2039-40	170	275	570	625	895	170
2040-41	180	290	605	655	945	180
2041-42	190	305	635	695	995	190
2042-43	200	320	670	730	1050	200
2043-44	210	335	705	770	1105	210
2044-45	220	355	745	810	1170	220
2045-46	230	375	785	855	1230	230
2046-47	245	395	830	905	1300	245
2047-48	260	415	875	955	1370	260
2048-49	275	440	925	1005	1445	275
2049-50	290	465	975	1065	1530	290
2050-51	305	490	1030	1120	1615	305
2051-52	320	520	1085	1185	1705	320

Table 6.7: Toll Revenue Over Concession Period

LMV	**LCV**	**TR/ BUS 2 axle**	**TR/ BUS 3 axle**	**MAV**	**Total /day Rs.**	**Total per) year (Rs.cr)**	**NET TOLL**	**NET TOLL**
							For 1 TP	For all TP
						16% Concession	0.84	
183590	102935	48060	48945	89600	473130	17.32	14.55	14.55
192770	108082	50463	52710	95760	499784	18.24	15.32	15.32
202408	120161	55929.8	56729.1	104076	539304	19.68	16.54	16.54
231849	133179	61817.2	62471.2	114836	604153	22.05	18.52	6.17
243442	147198	68153.4	70171.2	128357	657321	24.06	20.21	6.74
276915	162286	74968.8	76883.2	140901	731954	26.72	22.44	7.48
313127	178514	82295.3	84091	154379	812406	29.65	24.91	8.3
328783	195960	90167	93593.3	171103	879607	32.11	26.97	8.99
369881	214704	100593	101981	189114	976273	35.73	30.01	10
414267	234832	109764	112921	208499	1080283	39.43	33.12	11.04
462166	266300	121776	124700	229348	1204291	43.96	36.92	12.31
485275	289971	134715	137375	251762	1299097	47.42	39.83	13.28
539511	326217	148643	153258	278717	1446347	52.94	44.47	14.82
597958	353946	163627	168021	307738	1591290	58.24	48.92	16.31
660901	395620	179738	186361	338964	1761585	64.47	54.16	18.05
728644	427989	199827	206115	375870	1938445	70.95	59.6	19.87
801508	475823	221475	227379	415619	2141804	78.39	65.85	21.95
918091	527370	244788	250254	458404	2398907	87.8	73.75	24.58
1004162	582883	269878	274848	504427	2636199	96.48	81.05	27.02
1096545	642629	296866	304447	557951	2898437	106.08	89.11	29.7
1195656	706892	329420	336319	619810	3188096	116.68	98.01	32.67
1348434	792843	364488	374113	682004	3561881	130.36	109.51	36.5
1464678	867910	402238	411175	758228	3904229	142.89	120.03	40.01
1640439	967100	446953	454862	835454	4344809	159.02	133.58	44.53
1830115	1074039	490828	505938	923669	4824588	176.58	148.33	49.44
2034658	1189254	547015	556734	1024034	5351694	195.87	164.53	54.84
2255079	1313305	602847	620269	1132126	5923626	216.8	182.12	60.71
2492455	1446789	667878	684081	1254441	6545645	239.57	201.24	67.08
2747932	1590338	737906	757643	1386158	7219976	264.25	221.97	73.99
3022725	1769547	818761	836852	1541081	7988966	292.4	245.61	81.87
3318128	1962702	905858	927510	1701117	8815315	322.64	271.02	90.34
3711254	2170749	1005675	1030838	1887824	9806340	358.91	301.49	100.5
4135397	2394693	1113209	1142180	2088950	1.1E+07	398	334.32	111.44
4592677	2665899	1235662	1262079	2313474	1.2E+07	441.75	371.07	123.69
5085346	2958239	1367578	1404299	2572039	1.3E+07	489.98	411.59	137.2
5615800	3273148	1516959	1550662	2850677	1.5E+07	541.95	455.23	151.74
6186586	3647222	1677860	1722689	3160015	1.6E+07	600.03	504.03	168.01
4135397	2394693	1113209	1142180	2088950	1.1E+07	398	334.32	111.44

LMV	**LCV**	**TR/ BUS 2 axle**	**TR/ BUS 3 axle**	**MAV**	**Total /day Rs.**	**Total per) year (Rs.cr)**	**NET TOLL**	**NET TOLL**
4592677	2665899	1235662	1262079	2313474	1.2E+07	441.75	371.07	123.69
5085346	2958239	1367578	1404299	2572039	1.3E+07	489.98	411.59	137.2
5615800	3273148	1516959	1550662	2850677	1.5E+07	541.95	455.23	151.74
6186586	3647222	1677860	1722689	3160015	1.6E+07	600.03	504.03	168.01

Chapter 7

FINANCIAL PLAN FOR NATIONAL HIGHWAY PROJECT-A CASE STUDY ON SINNER PALGHAR ROAD

Present Scenario

At present, three different models –PPP Annuity, PPP Toll and EPC (Engineering, Procurement and Construction) were followed by the government while adopting private sector participation. Launch of the new model is due to many problems encountered as associated with the existing ones. Enormous number of stalled projects are blocking infrastructure projects and at the same time adding to Non-Performing Assets (NPAs) of the banking system. In this context, the government has introduced Hybrid Annuity Model (HAM) to rejuvenate PPP.

The Hybrid Annuity Model (HAM)

In India, the new HAM is a mix of BOT Annuity and EPC models. As per the structure, the organization will add to 40% of the endeavour cost in the underlying five years through yearly portions (annuity) [8]. The remainder of the portion will be made dependent on the benefits made and the presentation of the contractual worker. Here, half breed annuity infers the essential 40% portion is made as to the fixed entirety in five identical bits while the remaining 60% is paid as factor annuity total after the satisfaction of the undertaking unforeseen relying on the

estimation of benefits made. As the organization pays only 40% during the improvement arrange, the temporary worker ought to find the cash for the remainder of the whole. Here, he needs to bring the remaining 60% up as value and credits.

Features of HAM

By features the HAM is a mix between the existing two models – BOT Annuity and EPC. Hence to understand the HAM, the basic features of the existing PPP models are elucidated first.

a) The Build Operate and Transfer (BOT) Annuity Model

Under BOT annuity, a developer builds a highway, operates it for a specified duration and transfers it back to the government. The government starts payment to the developer after the launch of commercial operation of the project. Payment will be made on a six month basis.

b) BOT Toll Model

In this toll based BOT model, the contractor builds the road and he is permitted to recuperate his investments through toll accumulation. This toll gathering will be over a huge part which is just about 30 years a great part of the time. There is no administration portion to the contractual worker as he obtains the sum contributed from tolls.

c) Engineering, Procurement and Construction (EPC) Model

Under this model, the expense is completely borne by the government. Government welcomes the offer for specialized mastery learning from the private players. Obtainment of crude materials and cost of development are met by the legislature. The private player speculation is least and is confined to the game plan of designing aptitude. An inconvenience of the model is a high financial load for the administration.

Modes of delivery for highway projects:

In this research, following modes of delivery of project are identified in order of priority:

(a) BOT (Toll) without VGF

(b) BOT (Toll) With VGF

(c) BOT (Annuity)

(d) Hybrid annuity model (BOT Annuity plus VGF)

(e) EPC

All highways which are to be tolled should adhere to the BOT (Toll) mode in accordance with the extant framework approved by CoI/ Cabinet, especially a cap of 40% on the grant element.

Data and Assumptions

The case study of national highway of project was considered for financial analysis of project.

The construction of highway takes number of years and similarly maintenance and operational is carried out over period of time. Phase cost of project is calculated to be 328.71 crores. Construction cost in first year is 40% of phase cost and 60% of phase cost in second years. It is assumed that annual maintenance is 1% of phase cost of project and periodic maintenance is assumed to 6% of phase cost of project. The routine operation and maintenance cost is 3.29 crores and periodic maintenance is 19.72 crores which is calculated over period of 5 years. The costs of construction, annual maintenance and periodic maintenance are added with inflation of 5% over the concession period for each year. It is also assumed that 5% of yearly toll revenue will be spent on operations of toll plaza.

In respect of annuity projects, IRR has been considered @ 15% per annum for the purpose of calculation of annuity payments as per guidelines given "Financial plan for national highway development programme".

Case 1): BOT toll without VGF

In initial case it was assumed that no VGF will be provided by government. The cash flow was generated over the concession period of 30 years and IRR was calculated for same which shown in Table no 7.1 & 7.2 The cash outflow includes costs like cost of construction, annual maintenance, and periodic maintenance. Financial planning calculations are shown in Table no 7.3

Option with IRR of 14% is considered viable for financial planning of the project.

Net cash flow is calculated with difference of outflow minus inflow. Then In-

Table 7.1: Cash Outflow For Case 1 of BOT Toll Without VGF

Year	Constr cost	VGF	Inflation	Current Constn Cost t	Current Annual Maintenance	Current Periodic Maintenance	**Total Outflow**	
				5%	With inflation	With inflation		
2015	2016	131.48	0	1				
2016	2017	197.23	0	1.05	138.06	0	0	138.06
2017	2018			1.1	217.44	0	0	217.44
2018	2019			1.16	0	3.81	0	3.81
2019	2020			1.22	0	4	0	4
2020	2021			1.28	0	4.2	0	4.2
2021	2022			1.34	0	4.41	0	4.41
2022	2023			1.41	0	4.63	0	4.63
2023	2024			1.48	0	4.86	29.14	34
2024	2025			1.55	0	5.1	0	5.1
2025	2026			1.63	0	5.35	0	5.35
2026	2027			1.71	0	5.62	0	5.62
2027	2028			1.8	0	5.9	0	5.9
2028	2029			1.89	0	6.2	0	6.2
2029	2030			1.98	0	6.51	39.05	45.56
2030	2031			2.08	0	6.83	0	6.83
2031	2032			2.18	0	7.18	0	7.18
2032	2033			2.29	0	7.53	0	7.53
2033	2034			2.41	0	7.91	0	7.91
2034	2035			2.53	0	8.31	0	8.31
2035	2036			2.65	0	8.72	52.33	61.05
2036	2037			2.79	0	9.16	0	9.16
2037	2038			2.93	0	9.62	0	9.62
2038	2039			3.07	0	10.1	0	10.1
2039	2040			3.23	0	10.6	0	10.6
2040	2041			3.39	0	11.13	0	11.13
2041	2042			3.56	0	11.69	70.13	81.82
2042	2043			3.73	0	12.27	0	12.27
2043	2044			3.92	0	12.89	0	12.89
2044	2045			4.12	0	13.53	0	13.53
2045	2046			4.32	0	14.21	0	14.21
2046	2047			4.54	0	14.92	0	14.92
2047	2048			4.76	0	15.66	93.98	109.64
2048	2049			5	0	16.45	0	16.45
2049	2050			5.25	0	17.27	0	17.27
2050	2051			5.52	0	18.13	0	18.13
2051	2052			5.79	0	19.04	0	19.04

Table 7.2: Cash Inflow For Case 1 of BOT Toll Without VGF

		Annuity	Toll Revenue	Toll Collection Charges	**Total inflow**
				5% of toll revenue	
2015	2016				
2016	2017			0	0
2017	2018			0	0
2018	2019	0	6.17	0.31	5.87
2019	2020	0	6.74	0.34	6.4
2020	2021	0	7.48	0	7.48
2021	2022	0	8.3	0.42	7.89
2022	2023	0	8.99	0.45	8.54
2023	2024	0	10	0.5	9.5
2024	2025	0	11.04	0.55	10.49
2025	2026	0	12.31	0.62	11.69
2026	2027	0	13.28	0.66	12.61
2027	2028	0	14.82	0.74	14.08
2028	2029		16.31	0.82	15.49
2029	2030		18.05	0.9	17.15
2030	2031		19.87	0.99	18.87
2031	2032		21.95	1.1	20.85
2032	2033		24.58	1.23	23.35
2033	2034		27.02	1.35	25.66
2034	2035		29.7	1.49	28.22
2035	2036		32.67	1.63	31.04
2036	2037		36.5	1.83	34.68
2037	2038		40.01	2	38.01
2038	2039		44.53	2.23	42.3
2039	2040		49.44	2.47	46.97
2040	2041		54.84	2.74	52.1
2041	2042		60.71	3.04	57.67
2042	2043		67.08	3.35	63.73
2043	2044		73.99	3.7	70.29
2044	2045		81.87	4.09	77.78
2045	2046		90.34	4.52	85.82
2046	2047		100.5	5.02	95.47
2047	2048		111.44	5.57	105.87
2048	2049		123.69	6.18	117.51
2049	2050		137.2	6.86	130.34
2050	2051		151.74	7.59	144.16
2051	2052		168.01	8.4	159.61

ternal rate of return was calculated which was found to be 3.73%.

Case 2): BOT toll with VGF

In This case it was assumed that VGF will be provided by NHAI. The VGP of 40% of total phase cost is given by NHAI in two stages in 2016-17 and 2017-18 as shown in table below. The cash flow was generated over the concession period of 30 years and IRR was calculated for same cash inflow & outflow shown in Table no 7.4 & 7.5. The cash outflow includes costs like cost of construction, annual maintenance, and periodic maintenance.

Financial calculations Table for case 2 shown in Table no 7.6

Option with IRR greater than 15% is considered viable for financial planning of the project.

Net cash flow is calculated with difference of outflow minus inflow. Then Internal rate of return was calculated which was found to be 5.73%.

Case 3): BOT with annuity

Highway projects which are not amenable to BOT (Toll) mode, including projects which are not to be tolled under Government policy, should be undertaken on BOT (Annuity) mode .In this case it was assumed that NHAI would start payment to concessionaire as soon as project is started. The annuity is provided on total phase cost i.e. on 328.71 crores. The cash inflow and outflow shown in Table no 7.7 & 7.8

The annuity is calculated using capital recovery of economic analysis:

$$A=\left(P * \frac{i*(1+i)n}{(1+i)n-1}\right)$$

$$A=\left(328.71 * \frac{0.15*(1+0.15)5}{(1+0.15)5-1}\right)$$

A= 98.06 crores

The cash flow was generated over the concession period of 30 years and IRR was calculated for same. The cash outflow includes costs like cost of construction, annual maintenance, and periodic maintenance.

Option with IRR greater than 15% is considered viable for financial planning of the project calculations shown in Table no 7.9.

Table 7.3: Financial Planning Calculations For BOT Toll Without VGF

From	to	Years	Net cash flow	NPV
				Considering Interest=3.73%
2016	2017		138.06	138.06
2017	2018	0	217.44	209.62
2018	2019	1	-2.06	-1.91
2019	2020	2	-2.4	-2.15
2020	2021	3	-3.29	-2.84
2021	2022	4	-3.48	-2.9
2022	2023	5	-3.91	-3.14
2023	2024	6	24.49	18.95
2024	2025	7	-5.39	-4.02
2025	2026	8	-6.34	-4.56
2026	2027	9	-6.99	-4.85
2027	2028	10	-8.18	-5.47
2028	2029	11	-9.29	-5.99
2029	2030	12	28.41	17.65
2030	2031	13	-12.04	-7.21
2031	2032	14	-13.68	-7.9
2032	2033	15	-15.82	-8.81
2033	2034	16	-17.75	-9.53
2034	2035	17	-19.91	-10.3
2035	2036	18	30.01	14.97
2036	2037	19	-25.52	-12.27
2037	2038	20	-28.39	-13.16
2038	2039	21	-32.2	-14.39
2039	2040	22	-36.37	-15.67
2040	2041	23	-40.97	-17.01
2041	2042	24	24.15	9.67
2042	2043	25	-51.45	-19.86
2043	2044	26	-57.4	-21.36
2044	2045	27	-64.25	-23.04
2045	2046	28	-71.62	-24.76
2046	2047	29	-80.55	-26.85
2047	2048	30	3.77	1.21
2048	2049	31	-101.06	-31.31
2049	2050	32	-113.07	-33.77
2050	2051	33	-126.03	-36.28
2051	2052	34	-140.57	-39.02
		IRR	**3.73%**	

Table 7.4: Cash Outflow For Case 2 of BOT Toll With VGF

Year		**Constn Cost**	**VGF**	**Inflation**	**Current Constn Cost**	**Current Annual . Maintenance**	**Current Periodic Maintenance**	**Total Outflow**
				5%				
2015	2016			1				
2016	2017	131.48	78.89	1.05	55.22	0	0	55.22
2017	2018	197.23	52.59	1.1	159.46	0	0	159.46
2018	2019			1.16	0	3.81	0	3.81
2019	2020			1.22	0	4	0	4
2020	2021			1.28	0	4.2	0	4.2
2021	2022			1.34	0	4.41	0	4.41
2022	2023			1.41	0	4.63	0	4.63
2023	2024			1.48	0	4.86	29.14	34
2024	2025			1.55	0	5.1	0	5.1
2025	2026			1.63	0	5.35	0	5.35
2026	2027			1.71	0	5.62	0	5.62
2027	2028			1.8	0	5.9	0	5.9
2028	2029			1.89	0	6.2	0	6.2
2029	2030			1.98	0	6.51	39.05	45.56
2030	2031			2.08	0	6.83	0	6.83
2031	2032			2.18	0	7.18	0	7.18
2032	2033			2.29	0	7.53	0	7.53
2033	2034			2.41	0	7.91	0	7.91
2034	2035			2.53	0	8.31	0	8.31
2035	2036			2.65	0	8.72	52.33	61.05
2036	2037			2.79	0	9.16	0	9.16
2037	2038			2.93	0	9.62	0	9.62
2038	2039			3.07	0	10.1	0	10.1
2039	2040			3.23	0	10.6	0	10.6
2040	2041			3.39	0	11.13	0	11.13
2041	2042			3.56	0	11.69	70.13	81.82
2042	2043			3.73	0	12.27	0	12.27
2043	2044			3.92	0	12.89	0	12.89
2044	2045			4.12	0	13.53	0	13.53
2045	2046			4.32	0	14.21	0	14.21
2046	2047			4.54	0	14.92	0	14.92
2047	2048			4.76	0	15.66	93.98	109.64
2048	2049			5	0	16.45	0	16.45
2049	2050			5.25	0	17.27	0	17.27
2050	2051			5.52	0	18.13	0	18.13
2051	2052			5.79	0	19.04	0	19.04

Table 7.5: Cash Inflow For Case 2 of BOT Toll With VGF

		Annuity	Toll Revenue	Toll Collection Charges	**Total inflow**
				5% of toll revenue	
2015	2016				
2016	2017			0	0
2017	2018			0	0
2018	2019	0	6.17	0.31	5.87
2019	2020	0	6.74	0.34	6.4
2020	2021	0	7.48	0	7.48
2021	2022	0	8.3	0.42	7.89
2022	2023	0	8.99	0.45	8.54
2023	2024	0	10	0.5	9.5
2024	2025	0	11.04	0.55	10.49
2025	2026	0	12.31	0.62	11.69
2026	2027	0	13.28	0.66	12.61
2027	2028	0	14.82	0.74	14.08
2028	2029		16.31	0.82	15.49
2029	2030		18.05	0.9	17.15
2030	2031		19.87	0.99	18.87
2031	2032		21.95	1.1	20.85
2032	2033		24.58	1.23	23.35
2033	2034		27.02	1.35	25.66
2034	2035		29.7	1.49	28.22
2035	2036		32.67	1.63	31.04
2036	2037		36.5	1.83	34.68
2037	2038		40.01	2	38.01
2038	2039		44.53	2.23	42.3
2039	2040		49.44	2.47	46.97
2040	2041		54.84	2.74	52.1
2041	2042		60.71	3.04	57.67
2042	2043		67.08	3.35	63.73
2043	2044		73.99	3.7	70.29
2044	2045		81.87	4.09	77.78
2045	2046		90.34	4.52	85.82
2046	2047		100.5	5.02	95.47
2047	2048		111.44	5.57	105.87
2048	2049		123.69	6.18	117.51
2049	2050		137.2	6.86	130.34
2050	2051		151.74	7.59	144.16
2051	2052		168.01	8.4	159.61

Table 7.6: Financial Planning Calculations For BOT Toll with VGF

From	to	Years	Net cash flow	NPV
				Considering Interest=3.73%
2016	2017		55.22	55.22
2017	2018	0	159.46	150.82
2018	2019	1	-2.06	-1.84
2019	2020	2	-2.4	-2.03
2020	2021	3	-3.29	-2.63
2021	2022	4	-3.48	-2.64
2022	2023	5	-3.91	-2.8
2023	2024	6	24.49	16.58
2024	2025	7	-5.39	-3.45
2025	2026	8	-6.34	-3.84
2026	2027	9	-6.99	-4
2027	2028	10	-8.18	-4.43
2028	2029	11	-9.29	-4.76
2029	2030	12	28.41	13.77
2030	2031	13	-12.04	-5.52
2031	2032	14	-13.68	-5.93
2032	2033	15	-15.82	-6.49
2033	2034	16	-17.75	-6.89
2034	2035	17	-19.91	-7.3
2035	2036	18	30.01	10.41
2036	2037	19	-25.52	-8.37
2037	2038	20	-28.39	-8.81
2038	2039	21	-32.2	-9.45
2039	2040	22	-36.37	-10.1
2040	2041	23	-40.97	-10.76
2041	2042	24	24.15	6
2042	2043	25	-51.45	-12.09
2043	2044	26	-57.4	-12.75
2044	2045	27	-64.25	-13.5
2045	2046	28	-71.62	-14.23
2046	2047	29	-80.55	-15.14
2047	2048	30	3.77	0.67
2048	2049	31	-101.06	-16.99
2049	2050	32	-113.07	-17.98
2050	2051	33	-126.03	-18.95
2051	2052	34	-140.57	-20
		IRR	**5.73%**	

Table 7.7: Cash Outflow For Case 3 of BOT With Annuity

Year **Year**		**Constn Cost**	**VGF**	**Inflation**	**Current Constn Cost**	**Current Annual Maintenance**	**Current Periodic Maintenance**	**Total Outflow**
				5%				
2015	2016			1				
2016	2017	131.48	0	1.05	138.06	0	0	138.06
2017	2018	197.23	0	1.1	217.44	0	0	217.44
2018	2019			1.16	0	3.81	0	3.81
2019	2020			1.22	0	4	0	4
2020	2021			1.28	0	4.2	0	4.2
2021	2022			1.34	0	4.41	0	4.41
2022	2023			1.41	0	4.63	0	4.63
2023	2024			1.48	0	4.86	29.14	34
2024	2025			1.55	0	5.1	0	5.1
2025	2026			1.63	0	5.35	0	5.35
2026	2027			1.71	0	5.62	0	5.62
2027	2028			1.8	0	5.9	0	5.9
2028	2029			1.89	0	6.2	0	6.2
2029	2030			1.98	0	6.51	39.05	45.56
2030	2031			2.08	0	6.83	0	6.83
2031	2032			2.18	0	7.18	0	7.18
2032	2033			2.29	0	7.53	0	7.53
2033	2034			2.41	0	7.91	0	7.91
2034	2035			2.53	0	8.31	0	8.31
2035	2036			2.65	0	8.72	52.33	61.05
2036	2037			2.79	0	9.16	0	9.16
2037	2038			2.93	0	9.62	0	9.62
2038	2039			3.07	0	10.1	0	10.1
2039	2040			3.23	0	10.6	0	10.6
2040	2041			3.39	0	11.13	0	11.13
2041	2042			3.56	0	11.69	70.13	81.82
2042	2043			3.73	0	12.27	0	12.27
2043	2044			3.92	0	12.89	0	12.89
2044	2045			4.12	0	13.53	0	13.53
2045	2046			4.32	0	14.21	0	14.21
2046	2047			4.54	138.06	0	0	138.06
2047	2048			4.76	217.44	0	0	217.44
2048	2049			5	0	3.81	0	3.81
2049	2050			5.25	0	4	0	4
2050	2051			5.52	0	4.2	0	4.2
2051	2052			5.79	0	4.41	0	4.41

Table 7.8: Cash Inflow For Case 3 of BOT With Annuity

		Annuity	Toll Revenue	Toll Collection Charges	**Total inflow**
				5% of toll revenue	
2015	2016				
2016	2017			0	0
2017	2018			0	0
2018	2019	98.06	6.17	0.31	103.92
2019	2020	98.06	6.74	0.34	104.46
2020	2021	98.06	7.48	0	105.54
2021	2022	98.06	8.3	0.42	105.95
2022	2023	98.06	8.99	0.45	106.6
2023	2024	0	10	0.5	9.5
2024	2025	0	11.04	0.55	10.49
2025	2026	0	12.31	0.62	11.69
2026	2027	0	13.28	0.66	12.61
2027	2028	0	14.82	0.74	14.08
2028	2029	0	16.31	0.82	15.49
2029	2030	0	18.05	0.9	17.15
2030	2031	0	19.87	0.99	18.87
2031	2032	0	21.95	1.1	20.85
2032	2033	0	24.58	1.23	23.35
2033	2034	0	27.02	1.35	25.66
2034	2035	0	29.7	1.49	28.22
2035	2036	0	32.67	1.63	31.04
2036	2037	0	36.5	1.83	34.68
2037	2038	0	40.01	2	38.01
2038	2039	0	44.53	2.23	42.3
2039	2040	0	49.44	2.47	46.97
2040	2041	0	54.84	2.74	52.1
2041	2042	0	60.71	3.04	57.67
2042	2043	0	67.08	3.35	63.73
2043	2044	0	73.99	3.7	70.29
2044	2045	0	81.87	4.09	77.78
2045	2046	0	90.34	4.52	85.82
2046	2047			0	0
2047	2048			0	0
2048	2049	98.06	6.17	0.31	103.92
2049	2050	98.06	6.74	0.34	104.46
2050	2051	98.06	7.48	0	105.54
2051	2052	98.06	8.3	0.42	105.95

Net cash flow is calculated with difference of outflow minus inflow. Then Internal rate of return was calculated which was found to be 13.33 %.

Case 4): BOT with annuity plus VGF

Highway projects which are not amenable to BOT (annuity) mode, including projects which are not to be tolled under Government policy, should be undertaken on BOT (Annuity plus VGF) mode [9]. In this case it was assumed that NHAI would start payment to concessionaire as project is started as well as VGF of 40% of phase cost i.e. 131.48 is provided in two stages. Annuity is provided over period of 5 years on remaining 60% phase cost which is 197.23 crores. Cash inflow & outflow shown in Table no 7.10 & 7.11

The annuity is calculated using capital recovery of economic analysis:

$$A=\left(P * \frac{i*(1+i)n}{(1+i)n-1}\right)$$

$$A=\left(197.23 * \frac{0.15*(1+i0.15)5}{(1+0.15)5-1}\right)$$

A= 58.83crores

The cash flow was generated over the concession period of 30 years and IRR was calculated for same. The cash outflow includes costs like cost of construction, annual maintenance, and periodic maintenance.

Option with IRR greater than 15% is considered viable for financial planning of the project calculations shown in Table no 7.12.

Net cash flow is calculated with difference of outflow minus inflow. Then Internal rate of return was calculated which was found to be 13.33%.

Table 7.9: Financial Planning Calculations For BOT With Annuity

From	to	Years	Net cash flow	NPV
				Considering Interest=13.33%
2016	2017		138.06	138.06
2017	2018	0	217.44	191.87
2018	2019	1	-100.12	-77.95
2019	2020	2	-100.46	-69.02
2020	2021	3	-101.34	-61.44
2021	2022	4	-101.54	-54.31
2022	2023	5	-101.97	-48.13
2023	2024	6	24.49	10.2
2024	2025	7	-5.39	-1.98
2025	2026	8	-6.34	-2.06
2026	2027	9	-6.99	-2
2027	2028	10	-8.18	-2.06
2028	2029	11	-9.29	-2.07
2029	2030	12	28.41	5.58
2030	2031	13	-12.04	-2.09
2031	2032	14	-13.68	-2.09
2032	2033	15	-15.82	-2.14
2033	2034	16	-17.75	-2.12
2034	2035	17	-19.91	-2.09
2035	2036	18	30.01	2.78
2036	2037	19	-25.52	-2.09
2037	2038	20	-28.39	-2.05
2038	2039	21	-32.2	-2.05
2039	2040	22	-36.37	-2.05
2040	2041	23	-40.97	-2.03
2041	2042	24	24.15	1.06
2042	2043	25	-51.45	-1.99
2043	2044	26	-57.4	-1.96
2044	2045	27	-64.25	-1.93
2045	2046	28	-71.62	-1.9
2046	2047	29	138.06	138.06
2047	2048	30	217.44	191.87
2048	2049	31	-100.12	-77.95
2049	2050	32	-100.46	-69.02
2050	2051	33	-101.34	-61.44
2051	2052	34	-101.54	-54.31
		IRR	**13.33%**	

Table 7.10: Cash Outflow For Case 4 of BOT With Annuity Plus VGF

Year		**Constn Cost**	**VGF**	**Inflation**	**Current Constn Cost**	**Current Annual Maintenance**	**Current Periodic Maintenance**	**Total Outflow**
				5%				
2015	2016			1				
2016	2017	131.48	78.89	1.05	55.22	0	0	55.22
2017	2018	197.23	52.59	1.1	159.46	0	0	159.46
2018	2019			1.16	0	3.81	0	3.81
2019	2020			1.22	0	4	0	4
2020	2021			1.28	0	4.2	0	4.2
2021	2022			1.34	0	4.41	0	4.41
2022	2023			1.41	0	4.63	0	4.63
2023	2024			1.48	0	4.86	29.14	34
2024	2025			1.55	0	5.1	0	5.1
2025	2026			1.63	0	5.35	0	5.35
2026	2027			1.71	0	5.62	0	5.62
2027	2028			1.8	0	5.9	0	5.9
2028	2029			1.89	0	6.2	0	6.2
2029	2030			1.98	0	6.51	39.05	45.56
2030	2031			2.08	0	6.83	0	6.83
2031	2032			2.18	0	7.18	0	7.18
2032	2033			2.29	0	7.53	0	7.53
2033	2034			2.41	0	7.91	0	7.91
2034	2035			2.53	0	8.31	0	8.31
2035	2036			2.65	0	8.72	52.33	61.05
2036	2037			2.79	0	9.16	0	9.16
2037	2038			2.93	0	9.62	0	9.62
2038	2039			3.07	0	10.1	0	10.1
2039	2040			3.23	0	10.6	0	10.6
2040	2041			3.39	0	11.13	0	11.13
2041	2042			3.56	0	11.69	70.13	81.82
2042	2043			3.73	0	12.27	0	12.27
2043	2044			3.92	0	12.89	0	12.89
2044	2045			4.12	0	13.53	0	13.53
2045	2046			4.32	0	14.21	0	14.21
2046	2047			4.54	55.22	0	0	55.22
2047	2048			4.76	159.46	0	0	159.46
2048	2049			5	0	3.81	0	3.81
2049	2050			5.25	0	4	0	4
2050	2051			5.52	0	4.2	0	4.2
2051	2052			5.79	0	4.41	0	4.41

Table 7.11: Cash Inflow For Case 4 of BOT With Annuity Plus VGF

		Annuity	Toll Revenue	Toll Collection Charges	**Total inflow**
				5% of toll revenue	
2015	2016				
2016	2017			0	0
2017	2018			0	0
2018	2019	58.83	6.17	0.31	64.7
2019	2020	58.83	6.74	0.34	65.23
2020	2021	58.83	7.48	0	66.31
2021	2022	58.83	8.3	0.42	66.72
2022	2023	58.83	8.99	0.45	67.37
2023	2024	0	10	0.5	9.5
2024	2025	0	11.04	0.55	10.49
2025	2026	0	12.31	0.62	11.69
2026	2027	0	13.28	0.66	12.61
2027	2028	0	14.82	0.74	14.08
2028	2029	0	16.31	0.82	15.49
2029	2030	0	18.05	0.9	17.15
2030	2031	0	19.87	0.99	18.87
2031	2032	0	21.95	1.1	20.85
2032	2033	0	24.58	1.23	23.35
2033	2034	0	27.02	1.35	25.66
2034	2035	0	29.7	1.49	28.22
2035	2036	0	32.67	1.63	31.04
2036	2037	0	36.5	1.83	34.68
2037	2038	0	40.01	2	38.01
2038	2039	0	44.53	2.23	42.3
2039	2040	0	49.44	2.47	46.97
2040	2041	0	54.84	2.74	52.1
2041	2042	0	60.71	3.04	57.67
2042	2043	0	67.08	3.35	63.73
2043	2044	0	73.99	3.7	70.29
2044	2045	0	81.87	4.09	77.78
2045	2046	0	90.34	4.52	85.82
2046	2047			0	0
2047	2048			0	0
2048	2049	58.83	6.17	0.31	64.7
2049	2050	58.83	6.74	0.34	65.23
2050	2051	58.83	7.48	0	66.31
2051	2052	58.83	8.3	0.42	66.72

Table 7.12: Financial Planning Calculations For BOT With Annuity Plus VGF

From	to	Years	Net cash flow	NPV
				Considering Interest=13.33%
2016	2017		55.22	55.22
2017	2018	0	159.46	138.79
2018	2019	1	-60.89	-46.13
2019	2020	2	-61.23	-40.38
2020	2021	3	-62.12	-35.65
2021	2022	4	-62.31	-31.13
2022	2023	5	-62.74	-27.28
2023	2024	6	24.49	9.27
2024	2025	7	-5.39	-1.78
2025	2026	8	-6.34	-1.82
2026	2027	9	-6.99	-1.74
2027	2028	10	-8.18	-1.78
2028	2029	11	-9.29	-1.76
2029	2030	12	28.41	4.67
2030	2031	13	-12.04	-1.72
2031	2032	14	-13.68	-1.71
2032	2033	15	-15.82	-1.72
2033	2034	16	-17.75	-1.68
2034	2035	17	-19.91	-1.64
2035	2036	18	30.01	2.15
2036	2037	19	-25.52	-1.59
2037	2038	20	-28.39	-1.54
2038	2039	21	-32.2	-1.52
2039	2040	22	-36.37	-1.49
2040	2041	23	-40.97	-1.46
2041	2042	24	24.15	0.75
2042	2043	25	-51.45	-1.39
2043	2044	26	-57.4	-1.35
2044	2045	27	-64.25	-1.32
2045	2046	28	-71.62	-1.28
2046	2047	29	55.22	55.22
2047	2048	30	159.46	138.79
2048	2049	31	-60.89	-46.13
2049	2050	32	-61.23	-40.38
2050	2051	33	-62.12	-35.65
2051	2052	34	-62.31	-31.13
		IRR	**14.89%**	

Chapter 8

RESULTS

Table 8.1: Summary For IRR and VGF For Various Cases Of Financial Models

Sr no.	Option	Project cost	Grant 40%	Annuity in crores crores for period of 5 years	IRR	NPV	Concession period
1	**BOT-Toll(without VGF)**						
		328.71			3.73	-0.18	30 years
2	**BOT-Toll(With VGF)**						
		328.71	131.38		5.73	-0.21	30 years
3	**BOT-Annuity**						
		328.71		98.06	13.94	-0.05	30 years
4	**BOT-Annuity+VGF**						
		328.71	131.38	58.83	14.89	0.01	30 years

Options 1 and 2 have NPV closer to 0, but do not satisfy the minimum criterion of IRR which is 14%. From the result illustrated in Table no. ,it can be seen that Internal rate of return becomes maximum in case of option no. 4 i.e. BOT (annuity + VGF).It can be seen that corresponding NPV becomes zero, also the IRR value is greater than 14% which makes project financially viable. So it can be clearly suggested that option provided with payment given by NHAI in form of annuity and NPV of 40% can be more financially stable as compared to other option.

Case 1): BOT without VGF : The below mentioned fig no 8.1 shows relation of IRR and VGF for this case

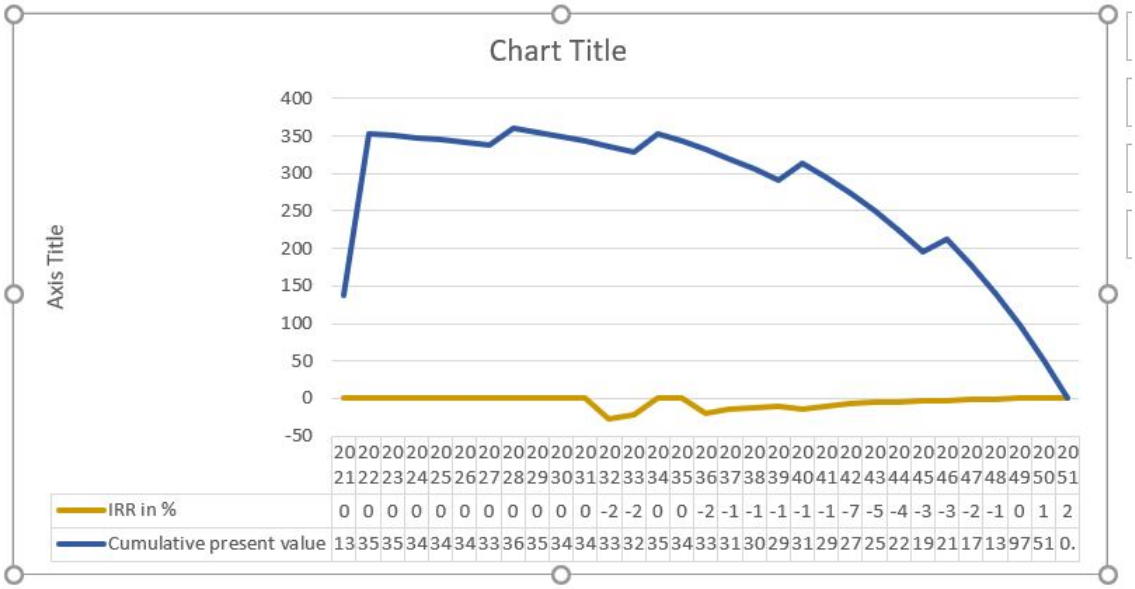


Figure 8.1: Graph representing IRR and VGF for case 1 of BOT without VGF

Case 2) BOT with VGF : The below mentioned fig no 8.2 shows relation of IRR and VGF for this case

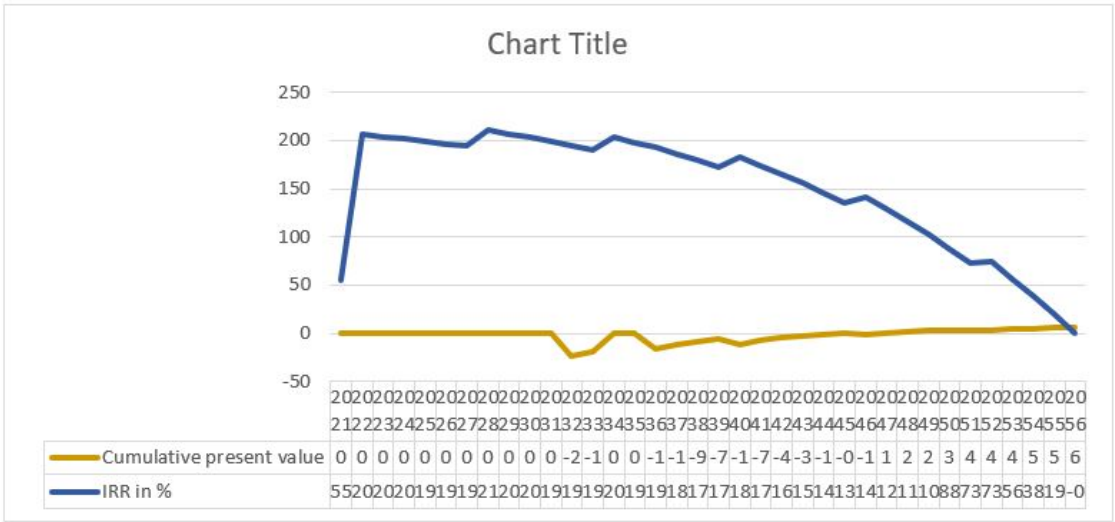


Figure 8.2: Graph representing IRR and VGF for case 1 of BOT with VGF

Case 3): BOT with annuity : The below mentioned fig no 8.3 shows relation of IRR and VGF for this case

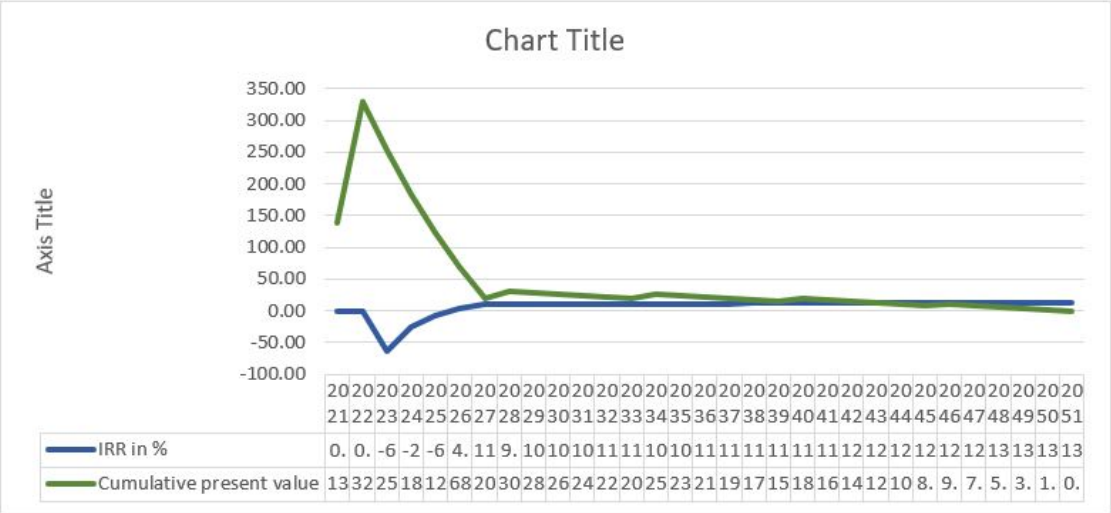


Figure 8.3: Graph representing IRR and VGF for case 1 of BOT with annuity

Case 4): BOT with annuity and VGF : he below mentioned fig no 8.4 shows relation of IRR and VGF for this case

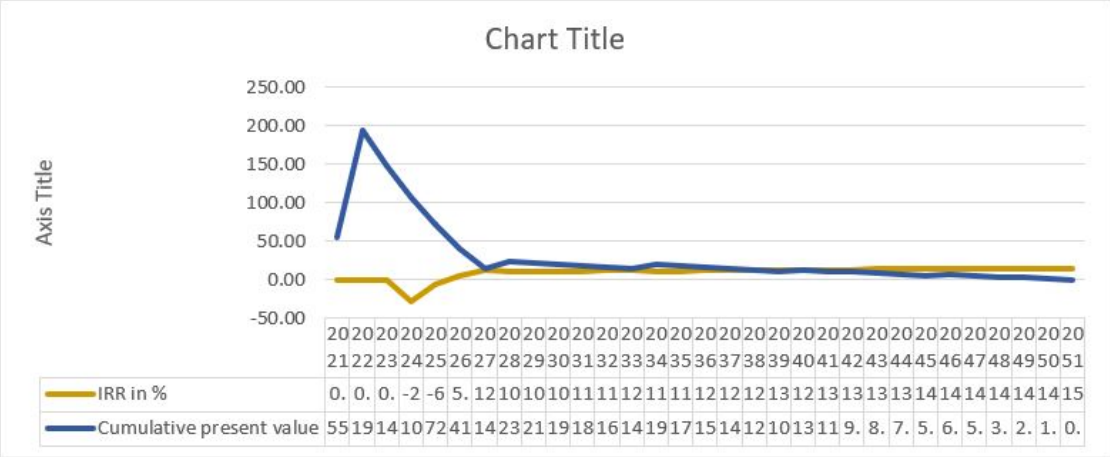


Figure 8.4: Graph representing IRR and VGF for case 1 of BOT with annuity and VGF

Chapter 9

Conclusion

The concessionaire models that have been used in current scenario in India are studied. The government funding plays a crucial role in selection of concessionaire model. The cash flow for different cases are created which are affecting for different concessionaire models. The financial viability of highway project through comparative analysis of different concessionaire models is studied. The contribution of paper is a graph that is proposed for selection of concessionaire model for financing highway project. The graph is plotted for IRR, NPV and concession period of project. The graph clearly depicts the payback period and corresponding IRR. The graph can also be used to identify most feasible option in case if multiple projects are found feasible within the concession period.

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LIST OF PUBLICATIONS ON PRESENT WORK

[1] Patil K.R. and Patil D. S., "Comparative Analysis of Concessionaire Models in Indian Highway Sector ", *International Journal on Advanced Science, Engineering and Information Technology*, 2019. (Under review)

[2] Patil Ketan R. and Patil Dhananjay S. , "Feasibility Analysis Of Highway Sector In India Through Comparative Analysis Of Concessionaire Models " *International Research Journal of Advance Research in Science and Engineering*,Vol. 7, Issue: 7, 2348-7550, July 2019. (Published)

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Comparative Analysis of Concessionaire Models in Indian Highway Sector

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ABSTRACT: *Investment in government infrastructure projects plays a significant role in progressive advancement and development of the country. However highway project puts a lot of financial constraints on the government. As a consequence Public private Partnership (PPP) was implemented which gives private entity an opportunity to make an investment in government infrastructure projects. Private entity willing to participate in investment schemes of infrastructure projects depends upon economic and financial viability of that project. This study focuses on various parameters such as Internal Rate of Return (IRR), Net present value (NPV), VGF (Viability Gap Funding) and Payback Period, which are required to perform financial analysis &feasibility analysis of the project. Observing these four parameters BOT annuity + VGF showed highest internal rate of return 14.89% for period of 30 years.*

KEYWORDS: Public Private Partnership (PPP), Internal Rate of Return (IRR),Net Present Value (NPV).

I. INTRODUCTION:

Investment in highway sector, in India, has increased tremendously in last 5 years. The total investment in year 2014-15 was Rs. 51,914 Cr and now it has increased 3 times i.e. Rs. 1,58,839 Cr in year 2018-19. The rate of road construction has also increased from 12 km/day in year 2014-15 to 30 km/day in year 2018-19. A requirement of 50 trillion is needed for various infrastructure projects and role of private entity has gained a lot of importance. There is a tremendous interest on public infrastructure and administrations worldwide while the administration spending plan of any nation is constantly restricted[1].

In India, the road projects are awarded by suitable selection of concessionaire models viz. BOT (Built Operate & Transfer) Toll Model, BOT Annuity Model and EPC (Engineering, procurement & construction) Model. Also the new advanced rendition of model concession understanding is introduced which is HAM (Hybrid Annuity Model).Previously, the budgetary and organizational assets of public authorities assumed a crucial job in financing expressway framework ventures [2]. In this research, study of these concessionaire models that are present in India is done. The appropriate selection of concessionaire model is very important for completion of the project successfully. Concessionaire modeling playsa significant role in assessment of projectsfor making project financing decisions by both the lenders and equity investors. In project finance, the


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Feasibility Analysis of Highway Sector in India through Comparative Analysis of Concessionaire Models

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***Abstract*— Investment in government infrastructure projects plays significant role in effective advancement and development of the country. However large scale highway development projects increases financial and budgetary burden on the government bodies. Therefore Public private Partnership (PPP) was referred which gives an opportunity to private sector to invest in infrastructure project. Interest of private sector to take part in investment of infrastructure projects rely upon financial and economic analysis of that project, which draws the viability in terms of benefits in near future as well as throughout the project lifecycle. This paper aims to study various concessionaire models available for financing a proposed national highway in India by carrying out the feasibility analysis of the project. It is necessary to compare all the models for highway project financing which will provide maximum returns on investment over a shortest period of time. Net Present Value (NPV) method of investment analysis is used where project will be compared in terms of present value of future returns, payback period and Internal Rate of Return (IRR) of the project. At the end through comparative analysis of concessionaire models, BOT annuity + VGF showed highest Internal Rate of Return 14.90% within concessionaire period of 30 years.**

***Keywords*— Public Private Partnership (PPP); Internal Rate of Return (IRR); Net Present Value (NPV)**

I. INTRODUCTION

India has prerequisite of project of worth Rs. 50 trillion and role of private segment investment has picked up part of significance to have economical improvement of nation.There is an enormous interest on public infrastructure and development worldwide though the development spending plan of any nation is constantly restricted [1].

In our country, the highway projects are granted utilizing one of Model such as Built, Operate & Transfer (BOT) Toll Model, BOT Annuity Model &Engineering, procurement & construction (EPC) Model. Also the new advanced version of model concession agreement is introduced which is HAM (Hybrid Annuity Model). Previously, the money related and hierarchical assets of open authorities assumed an imperative job in financing expressway foundation projects [2]. In this study present concessionaire models in India were studied. The selection of appropriate concessionaire model is crucial for successful completion of project. Concessionaire modeling plays a primitive role in evaluation of projects for making project financing decisions by both the lenders and equity investors. In project finance, the funding agencies look into the expected future returns in relation to the amount of the initial investment while making the investment decision. Equity investors used financial model to evaluate the returns from the project in order to ascertain their adequacy. On the other hand, financial model was used by lenders to know the level of cover for their loans and the timeliness of project debt service payments.

The Net Present Value (NPV) method of investment analysis was utilized for selection of concessionaire model. NPV method uses the concept of discounted cash flow analysis for the evaluation. The NPV strategy as a project evaluation or capital budgeting procedure demonstrates how an investment in project influences organization investors' riches in present worth terms [3].

The typical steps in discounted cash flow analysis involve:

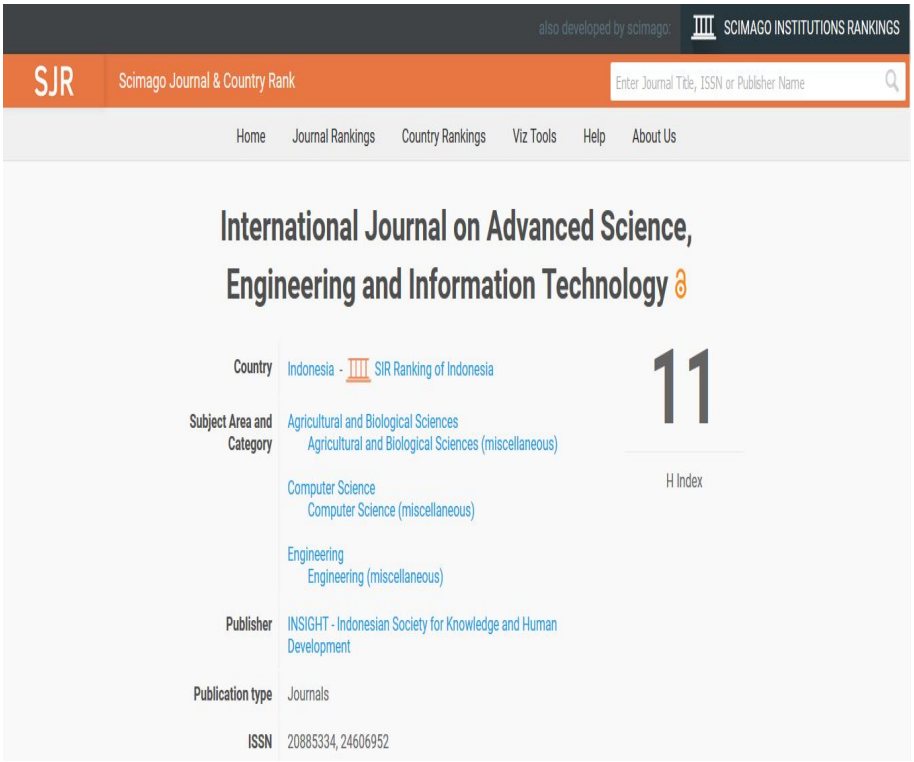
1) Future cash flows based on toll revenue.

2) Computing IRR for discounting returns.

3) Computing the present worth of the expected future returns.

4) Compare whether the project is worth more than its cost.

The numerous parameter required in NPV method were identified which are required for decision making of



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Submitted By,

Mr. Ketan Rangrao Patil

1727001

Under the Guidance Of

Prof. D. S. Patil

Co-Guide

Mr. Milind Kulkarni

Civil Engineering Department

In partial fulfillment of the degree M- TECH

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2. Name of student : - Patil Ketan Rangrao
3. Date of registration : - August
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6. Proposed title :-"Feasibility Analysis of Highway Sector in India through Comparative Analysis of Concessionaire Models"

7. INTRODUCTION

India has the second largest road network in the world. Investment in road sector has gone up from 0.4 million km in 1950-51 to 3.32 million km in 1995-96. Earlier the budgetary resources from the governments have been major source of finance for infrastructure and road projects in India. Between 1947 and 1988, India witnessed no new major projects, all the roads were poorly maintained, and there were no expressways. So in order to keep a pace with the growing traffic there was need of improvement of road network along with that there was a need to improve National highway as significant portion were single lane. In 1988 an autonomous entity called the National Highway Authority of India (NHAI) was established by an act of parliament but it came into existence on June 15th 1989. The main aim of NHAI was to develop and built the national highway in India.

The decline of allocation of funds over various plan periods in terms of percentage has been one of the major factors which are responsible for inadequacy in the road network. The lack of investment slowed down modernization, and inadequate attention to maintenance worsen the overall situation. Besides constraints in the budget the traditional procurement system has serious lapse and weakness in planning and implementing the road projects leading to time and cost overruns.

The steady economic growth due to economic liberalization in 1991 has resulted in high traffic growth so to decongest highways there was a demand to improve the road system. The up gradation of Indian road network had gained utmost importance in the

post liberalization era, as the delay in road projects could result in high inventory cost thus affecting India's competitiveness in the international market. Some changes were made after liberalization in the mode of procurement in infrastructure projects basically road projects. The central and the state government adopted PPP in place of a traditional public procurement process for a development of a limited stretches of the road network. The main reasons governments are opting to use PPP's for the development of infrastructure is to use skills, innovations and managerial capability of the private sector to optimize efficiency in infrastructure projects (Singh et al.,2006). PPP also helps with an objective of using private financing to address the funding needs.

The government in the year 1998 launched national highway development program (NHDP) in a view to upgrade, rehabilitate and widen major highways in India to a higher standard in order to boost economic development of the country. National highways account only about 2% of the total length of roads, but carry about 40% of the total traffic.

The infrastructure sector has become the biggest focus area of the government of India especially highway road construction. In union budget 2018-19 US $ 92.2 billion was allocated to this sector. Increased impetus to develop infrastructure in the country is attracting both domestic as well as international players. In highway sector the government's policy to increase private sector participation have proven a boon in infrastructure industry with large number of private players entering the business through public private partnership models. During next 5 years the investment through PPP is expected to be US $ 31 billion. India has requirement of investment of worth Rs 50 trillion and role of private sector participation has gained lot of importance to have sustainable development of country.

The BOTs are good projects which deliver value for money when they are toll financed. The design and construction risk to private partners. The second view holds that BOT need for private finance to provide infrastructure facility or service, BOTs will therefore have extensive recourse to debt finance, with risks for investors reduced through availability payments in place of tolls in order to lower the cost of finance and attract a bigger pool of investors.

To overcome this, the NHAI has incorporated two more concessionaire models EPC (Engineering Procurement and Construction) and HAM (Hybrid Annuity Model).The EPC contract plays vital role in infrastructure development. Due to investment of private partners in BOT, risk is more to private sector, mainly to the landers or financers which goes into bad loans and delay in project completion. Because of these risk factors nowadays there is low interest from the investors in BOT. Therefore Government is moving towards EPC and HAM because risk is shared between public and private partner.

It is proposed to study various methods of concessionaire models like EPC, HAM and BOT that are being incorporated in India. After carrying out comparative study of these models in respect of Internal rate of return and Economic internal rate of return an appropriate concessionaire model will be selected for carrying out the detailed feasibility analysis of a new highway construction project being executed.

8. PRESENT THEORIES AND PRACTICES

8.1. Buen,O. and Mantilla.B.J.O., (2000) : PPPs for Road Development in Mexico

There is huge dependence on private investment as there are inadequate budget provisions by Mexico government. The changes in political scenario can have huge impact on the road infrastructure sector. The political risks are not covered in this research paper. The public sector is inefficient in managing the PPPs modeled project. The staff and personnel's of public sector do not get involved in planning these projects but only execution. Role of private consultants not included in the paper which can improve the project management in road infrastructure.

8.2. Singh, L.B. and Kalidindi, S.N., (2006): Traffic revenue risk management through annuity model of PPP road projects in India.

Government of India has been promoting involvement of private entrepreneurs in development of road projects in India through Public private Partnership (PPP). PPP brings in additional capital and imparts techno-managerial efficiency in the project development and operations. But lack of risk analysis has made private entrepreneurs

reluctant for PPP. So there was a need to revamp the old BOT model and Annuity model was introduced. This paper aims to identify the risk involved in Annuity model.

8.3. Boeing Singh, L. and Kalidindi, S.N., (2009): Criteria influencing debt financing of Indian PPP road projects: a case study.

PPP projects are characterized by highly leveraged capital structure. This paper mainly focuses on the risk and aspects of PPP road projects that lenders look into while making the decisions to extend project finance loans to PPP road projects. Lenders who provide the major portion of financing in the form of debt and are more concerned with the downside risks and the measures to mitigate the risks. The case study research with the four Indian lending institutions is done and it helped in identifying the various aspects that they look into while making the credit decision.

8.4. Ashuri, B. and Mostaan, K., (2015): State of Private Financing in Development of Highway Projects in the United States

The different strategies of private financing are used by different Departments of transports in U.S. which are studied by author. Accordingly it was found that private financing was considered to be instrument to fill gap of funding and financial shortfall but author suggest that private financing could be used as a solution to gain lifecycle cost efficiencies, encourage competition and transfer critical risk on private sector. The organizational policies, inefficient project development processes and nonflexible procurement method were major concerns of effective utilization of private finance. The research can help in accurate decision to engage in private financing in developing of highway projects.

8.5. El-Sayegh, S.M. and Mansour, M.H., (2015): Risk Assessment and Allocation in Highway Construction Projects in the UAE

The risk assessment mentions poor contract forms between government and contractor but there is lack of information on the financial models for infrastructure project. The dependability of infrastructure sector in UAE is on the oil prices. This aspect is not covered in risk assessment. UAE is number one in providing public infrastructure facilities. Therefore the competitions in contracts have increased over the years. This is

forcing the contractors to lower tender prices in order to win work thereby eroding profit margins.

8.6. Ashuri, B. and Mostaan, K., (2016): Challenges and Enablers for Private Sector Involvement in Delivery of Highway Public–Private Partnerships in the United States

In this paper less focus is given on financial models for public private partnership. There is inadequate maintenance of roads in America because of failure to consider the true life cycle cost of maintaining and infrastructure asset over its entire expected life. More than 90% of revenues for infrastructure projects come from federal taxes on gasoline and diesel fuel. Inflation has reduced the purchasing power of these funds for maintenance and expansion of infrastructure projects. Hence better financial models need to be implemented considering above fact. There is advancement in technology in the private sector but lacks full public sector support.

8.7. Tokiwa,N.,Queiroz,C.,(2017): Guarantees and Other Support Options for PPP Road Projects: Mitigating the Perception of Risks.

The main aim of this paper is how financing can be effectively utilized in the preparation and implementation of PPP programs in highway development. In developing economies where public partner may not be sufficiently creditworthy in the eyes of private financers and may not be able to attract private investments without external support and role of private investment is must for development. So for successful implementation of PPP identification of risk is must. This paper includes identification of risks for each stage of the project and allocate responsibility for the identified risks between the public and private sector and mitigating that risk. Political risks and change in government policies in developing economies impacts infrastructure development to a great extent. So minimizing the impact and making PPP more attractive for sustainable development.

9. RESEARCH GAP

In, literature mentioned above the political scenario has been considered very less which one of the important aspects in India. These studies just present the improvement

techniques for existing models which are practice no new concept of financial model is introduced and more emphasis is given on BOT which is fully dependent on private financing.

10. PROBLEM STATEMENT

The most important aspect which affects road construction is financing of that project. The project aims to study various concessionaire models available for financing of proposed National Highways in India by carrying out feasibility analysis of a project.

11) OBJECTIVES

1) To study various concessionaire models available for highway projects.
2) To identify parameters/ factors through case studies which are responsible for selection of concessionaire model for highway projects.
3) To do the feasibility analysis of a proposed Sinnar Palghar highway project.
4) Based on the results; recommend a suitable concessionaire model for the project.

12. METHODOLOGY

PHASE 1

Study of literature related to highway construction contracts from different countries.

PHASE 2

ANALYSIS OF CASE STUDIES ON-GOING NATIONAL HIGHWAY PROJECTS BEING EXECUTED UNDER DIFFERENT CONCESSIONAIRE MODELS

The government has announced enormous road projects to improve route connectivity in India. For the same, new models have been proposed as a variation of PPP's in India which has triggered various investment flows. The feasibility analysis of the existing models for on-going projects has been carried out by consultants empaneled with the Central Government. A case study for each of these models shall be done as a part of this project.

BUILT OPERATE TRANSFER MODEL

The present policy framework offers two models in PPP - BOT (Toll) and BOT (Annuity). The case study for Feasibility Analysis of this financial model is the Capacity Augmentation of Mumbai-Pune Expressway considered for this project.

BUILT-OPERATE-TRANSFER (TOLL)

In BOT (Toll) project, a concession is granted by the government to a concessionaire who is responsible for construction, financing, operation and maintenance of a facility over the period of the concession before transferring the facility at no cost to the project.

ENGINEERING, PROCUREMENT AND CONSTRUCTION (EPC)

EPC model is a contract between the government and the private sector player for public infrastructure building. Under this system, the entire project is funded by the government. The contractor builds the project by designing, installing and procuring necessary labour and land to construct the infrastructure, either directly or by sub-contracting. All the clearances, land acquisition and regulatory norms have to be completed by the government itself and private players do not have to get itself involved in these time taking procedures. The case study for this model is Rehabilitation and Up-gradation of National Highway Section from Tasgaon-Shirdhon in the state of Maharashtra.

HYBRID-ANNUITY MODEL (HAM)

The new HAM model is a mix of BOT (Annuity) and EPC models. As per the design, the government will contribute to 40% of the project cost in the first five years through annuity payments. The remaining amounts of 60% are to be raised in the form of equity or loans. There is no toll right for the developer. The case study for on-going HAM project is the National Highway Section from Sinnar to Shirdi in the state of Maharashtra.

PHASE 3

FEASIBILITY STUDY AND PREPARATION OF DETAILED PROJECT REPORT FOR REHABILITATION AND UP-GRADATION OF PROPOSED NATIONAL HIGHWAY IN THE STATE OF MAHARASHTRA

The main objective of Feasibility Analysis is to establish the technical, economical, and financial viability of the project. It shall be done by taking into account the requirements with regard to rehabilitation, up gradation and improvement based on highway design, pavement design, provision of service roads wherever necessary, type of intersections, rehabilitation and widening of existing and construction of new bridges and structures, road safety features, quantities of various items of works and cost estimates and economic analysis.

PHASE 4

SELECTION OF RELEVANT CONCESSIONAIRE MODEL BASED ON FEASIBILITY ANALYSIS

The financial viability of the project is done based on the Feasibility Study under a commercial format and under different user fee scenarios and funding options. The financial analysis will cover internal rate of return, projected income statements, balance sheets, and fund flow statements. The sensitivity analysis will also be done for a number of probabilistic scenarios.

The financial analysis will also cover identification, assessment, and mitigating measures for all risks associated with the project. The risks related to construction delays, construction costs overrun, traffic volume, revenue shortfalls, operating costs, exchange rate variations, and convertibility of foreign exchange, interest rate volatility, non-compliance or default by contractors, political risks and force majeure.

Based on the above mentioned analysis, the positive ways of enhancing the project viability and the concessionaire model for implementation of the project shall be proposed.

13. Facilities Available

The following facilities to carry out experimental and analysis work are available at Dhruv Consultancy Services Ltd., Navi Mumbai and at Rajarambapu Institute of Technology, Rajaramnagar.

1. Central library for references journals and books.
2. Digital library for refer literature from national and international journals.
3. External Sources – Dhruv Consultancy Services Ltd., Navi Mumbai.

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Page...../.....

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Feasibility Analysis of Highway Sector in India with Comparative Analysis of its Concessionaire models

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