

New Sustainable Model of Public Private Partnership for Indian Road Infrastructure

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Abstract

Road network is an essential component for the development of country and for developing countries; lack of funds is the main challenge in expanding the road network. The public private partnership (PPP) models are the best solution to overcome the financial challenges in development. In order to attract private agencies to invest in the project, it is necessary for all the developing countries to design the PPP model very carefully and in such a way that it will sustain over the long run. This paper gives insights of major stakeholders in the PPP model along with their roles and responsibility, various PPP models used in the world, modes of contracting used in India for road development and comparison between them. The Hybrid Annuity Model (HAM) which revitalized the private sector investment and boosted the Indian infrastructure sector is thoroughly studied and problems associated with HAM are identified. In this study, new PPP model is explained for the Indian Road Infrastructure sector which will be better than the existing HAM model over the long run. Also for better management of road assets and maintenance of roads, Output and Performance based Road Contracts (OPRC) model is recommended based on the literature study.

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I. INTRODUCTION

India has second largest road network over 5.9 million kilometers in 2019, after the United States of America, which road network exceeds 6.85 million kilometers in total length. Indian road network consists of National Highways (NH), State Highways (SH), Major District Roads (MDR), Other District Roads (ODR) Roads and Village roads (VR). India has road density of 1.70 km per square kilometer of land and around 4.63 km of roads per thousand people [13]. Today, out of total Indian roads more than 62.5% roads are paved roads. India's transportation sector contributes around 4.7% towards GDP (Gross Domestic Product) of country [14].

Roads connect villages, hilly areas and remote places to the developed portion and helps in the overall development of the country. Roads provide access to employment, education services, social growth, market place for agriculture, health and other facilities to the undeveloped areas thereby increasing the standard of living of the people. In India road transport carries around 64.5% of freight and 90% of passenger traffic by providing door to door

connectivity [14]. Border Roads Organization (BRO) is separate agency working for the economic growth of border areas and for development of the roads of strategic importance.

In order to expand the road network there is need of funds for construction of new roads and maintenance of the existing road network. The Government of India (GoI) is planning to expand the national highway network to over 200,000 km [14]. In order to achieve this objective and raise the funds, concept of PPP (Public Private Partnership) was started in India in 1990 [1]. The major benefits of PPP are, to overcome the difficulties in project finance and reduce the workload of government sector. By introducing PPP, the private sector brought technology and innovation in order to

provide better quality of work within stipulated time and cost. By using PPP the possible risk of investment of fund is distributed between the government and private sector and sustainable development is achievable in road infrastructure sector.

II. METHODOLOGY

In order to create new PPP model the following methodology is adopted.

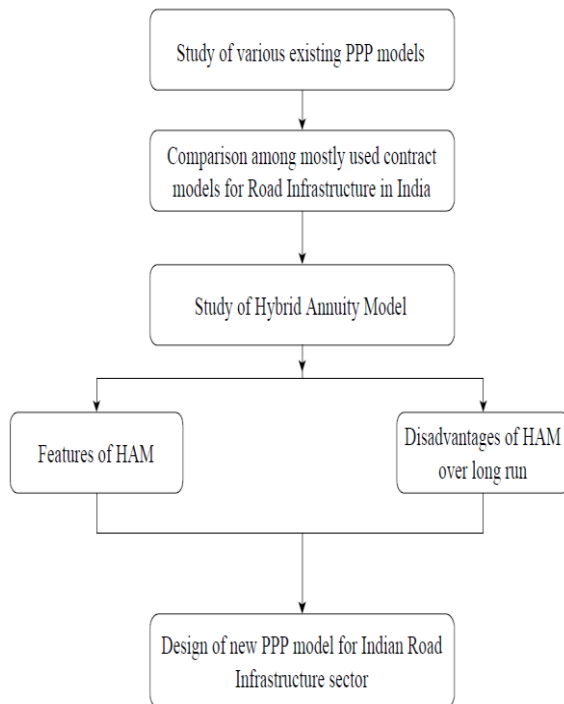


Figure 1 Framework of Study Methodology

To understand PPP in better way, it is essential to know about the stakeholders involved in PPP, their roles and responsibility.

➤ Stakeholders, roles and responsibility of them and various PPP Models

Authority (Government Agency): The authority is the one which is known as "Public" entity in PPP. The Authority is involved in the project, from its initial stage i.e. from inception of idea to the end of project. It plays managing role among all the stakeholders of PPP. Authority does feasibility study, carry out bidding procedure, entering into agreement and take the responsibility of monitoring the project along with the independent engineer [4]. Authority plays balancing role between lenders, private player and road end users. Authority is overlooking the project on behalf of government and aiming for quality work within stipulated time with optimum cost.

Private Player: Private player is the one, who takes part in the PPP as a "Private" entity. Private player may be a individual company or consortium who bids for the project with the information provided in the bidding document and with their own calculations [4]. Based on the type of model of PPP, the bid will

be awarded to the competent bidder who qualified the technical and financial criteria. The winner of the bid has to build, finance, operate and maintain the project as per the PPP model adopted for the bid. For the financing, private player has to open escrow account as per the agreement and deposit all funds constituting financial package.

Lenders: Lender is the one who gives or lend money to the private player for the construction/building of the project. Lender can be NBFC (Non banking financial Corporations) or banks or consortium of banks. The lender provides finance to the private player based on the equity of the private player, revenue from the project and return period of the debt provided [4]. If the project fails or terminates, lender will get back his all money according to agreement's terms and conditions.

Users: The project is carried out for the users. They are indirectly involved in the project and forms part by using the road and paying the revenue. Users create demand for new connectivity and new project. Hence in PPP projects users are important stakeholders.

➤ Examples of few variants of PPP model for road projects

1) BOT (Toll) model - In this PPP model the concessionaire/ developer (private player) has to finance, construct and carry out O&M (operation and maintenance) of the road. The cost incurred for construction and maintenance is recovered through revenue in the form of toll, from road users. Amount of toll is based on the GoI (Government of India) toll policy and concession period depends on road capacity, nature of traffic and maximum up to 30 years [1].

2) BOT (Annuity) mode - This PPP model is different from BOT toll as, in this model developer gets semi-annual annuity in the form of fixed amount from the authority. The risk of revenue collection through toll is taken by the Authority in this model. The road construction, O&M and entire finance are the responsibility of the developer only [2]. The concession period is generally 20 years.

3) Least Present Value of Revenue (LPVR)- The LPVR model of PPP is same as BOT toll model

except that, here the concession period is not fixed. The concession period is variable which is advantageous for both Authority and developer. If revenue is not generated as per expected traffic and due to change in toll policy, then concession period will be increased and vice versa.

4) Design Build Operate Transfer (DBOT)- This is integrated procurement model that combines designing activity along with construction and maintenance of road. The financing for the project is done by the Authority. This is like 'Turnkey' contract, where authority will have to finance only and revenue collection is also lies with authority [4]. The advantage of this model is, as private player knows he has to carry out O & M for long period, he prepare design accordingly and maintain quality in the work. Also as design and construction agency is same there will be no dispute between designing agency and executing agency based on drawings, material specification etc. which will avoid delays.

5) Design Build Finance Operate Transfer (DBFOT) - This is similar to DBOM model except the finance for the project is also a responsibility of the private player. All the revenue generation and some grant will be provided by the Authority as per contract conditions [5]. The main advantage of this type of PPP is the public sector (Authority) shifts the risk of financing and revenue collection risks to the private player.

6) Hybrid PPPs (Toll + Annuity; Grant +Annuity; Grant + Toll + Annuity) - This is combination of one or two models of PPP. In this model finance for the project is given by Authority as well as by private player. The construction, O & M is with the private player but revenue collection is the responsibility of the Authority [6]. The annual payments are made to the private player like BOT annuity model.

7) Output & Performance Based Road Contracts (OPRC) - OPRC is type of PPP model which is nowadays adopted mainly for road asset management and maintenance of roads. The entire finance is done by the Authority and periodic payment is released which is based on the road service level [7]. Hence this is different from the traditional contract of O&M.

8) Swiss Challenge - Swiss challenge method is the

best opportunity for private sector to express their ideas and project to the government/ authority, and with the help of financial support from the government, bring that project into reality. In this PPP model private player bring proposal with innovative ideas towards Authority [4]. Authority will check the feasibility of the project from each and every aspect and take decision, whether to support the project or not. Authority may seek for the innovative ideas and cost estimates from the different bidders for the same project. Based on received estimates, first priority is given to the original private player who brought the project and to carry out the project at the lowest bidding, if he denies, then the bid is awarded to the lowest bidder. This method is nowadays becoming popular as it is producing innovative ideas and concept, over traditional approach.

➤ ***Contracting mode and PPP models for road projects mostly used in India***

The oldest and one of the favorite modes of contracting for road projects is EPC contract. In EPC contract engineering, procurement and construction is responsibility of contractor/ private player. The finance is entirely provided by the authority and revenue generation is also responsibility of the Authority [8].

The PPP models were introduced to lower the financial risk of the authority. In India BOT toll, BOT annuity and DBFOM was introduced and adopted by the private player. When the development of road sector through PPP model is compared with the expected it is found unsatisfactory in 2008, as overall investment is far below than the expected. The private investment got stagnant in the period of 2012-2015. The Indian road sector has been experimenting and facing the challenges of PPP over two decades, and after many PPP project awards fell during the period of 2012-2015; there is need of change the policy in existing PPP models [3]. The traditional engineering, procurement and construction (EPC) contracts get popular in this period as entire financial risk is on the government, but it lead to stress on the public finance. As a middle path there was need of new PPP model which would attract private player in road infrastructure sector. These lead to development of HAM (Hybrid annuity model) in PPP model of Indian road sector.

In India EPC, BOT toll, BOT annuity, DBFOM and HAM are the contracting modes for the road development projects. They can be easily compared

based on the essential parameters in road construction project as indicated in Table no. I

Table I Comparison between different contracting modes mostly used in India for Road Infrastructure projects

	Financing Agency	Construction Agency	Operation & Maintenance Agency	Concession Period	Generated Revenue /Toll collection is property of
EPC	Government/ Authority	Private Agency	Government/ Authority	NA	Government/ Authority
BOT Toll	Private Agency	Private Agency	Private Agency	Up to 30 years	Private Agency
BOT Annuity	Private Agency	Private Agency	Private Agency	Up to 20 years	Authority
DBFO M	Private Agency	Private Agency	Private Agency	Up to 15-20 years	Private Agency
HAM	Both Authority and Private Agency	Private Agency	Private Agency	15 years	Authority

III. STUDY OF HYBRID ANNUITY MODEL (HAM) IN INDIAN ROAD INFRASTRUCTURE

HAM is the combination of EPC and BOT Annuity model, in which 40 % of the finance is given by the Authority and private player has to arrange 60% of the total project cost. The total project cost in HAM is summation of NPV (Net Present Value) of the project during concession period (15 years) and NPV of O&M cost during the O&M period. The bidder who quote lowest bid will be awarded with the contract [3].

➤ *Salient features of HAM*

The features of HAM which attracted private player are as follows -

- Initial 40% finance by Authority and paid to private player based on the progress of work (in 5 equal installments of 8% each)
- Balance 60% of project cost adjusted for the Price Multiple Index (linked with both consumer and wholesale price indexes, in the ratio of 70:30) will be given in 30 biannual installments during the concession period of 15 years.
- Bonus on early completion will be paid by the Authority to the concessionaire if he completes the work and

achieve COD (Commercial Operation Date) on or more than 30 (thirty) days prior to the scheduled completion date

- Mobilization advance in two installments up to 10 % of project cost shall be provided by the Authority on request of concessionaire and with the rate of interest equal to bank rate. This advance is recovered by adjusting the annual payments during the project construction period ie. in first five installments.
- Interest shall be due and payable on the reducing balance of completion cost at an interest rate equal to the applicable bank rate plus 3%. The concessionaire will get such interest along with each biannual installment payable to him [9]
- The O&M payments are made along with the annuity payments, they will also be inflation indexed based on the bidder's quote for O&M.
- Toll collection is the responsibility of the Authority and private player will not get affected due to the change in toll policy of GoI or when expected traffic does not meet, after the road construction is over.

The following figure will provide overview of HAM model

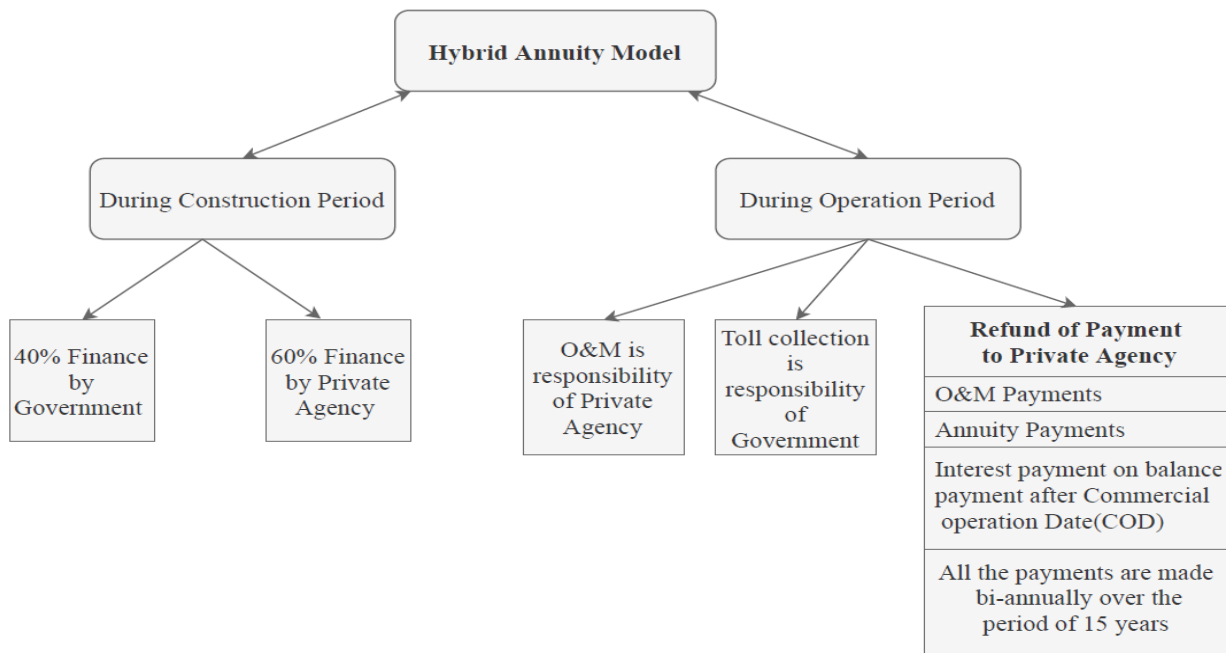


Figure 2 Overview of HAM Model in Indian Road Infrastructure

➤ **Disadvantages of HAM over long run**

The Hybrid Annuity Model (HAM) introduced in 2015 by Indian government brought new energy and boosted once again the private sector investment in road infrastructure sector. Till July 2018 based on HAM model, projects worth of Rs. 1.18 trillion has been awarded [15]. However if we study in depth about this model and current scenario of global market, there is need of modify the existing HAM model. If the same model is followed for long run then soon India will face the challenge of lack of finance in coming decade. This is due to the following findings in existing HAM model.

- **Bidding criteria for project** - In HAM model total project cost includes project construction cost and O&M cost based on NPV, ie. life cycle costing approach is adopted. This approach is elegant in theory but complex in practice to compute the cost of project. Also the NPV is also depending on Price Multiple Index (linked with both consumer and wholesale price indexes, in the ratio of 70:30) [3]. These give ample scope for arbitration in future, after COD(Commercial Operation Date), during biannual payments to the concessionaire.
- **No control on the O&M cost entered in financial bid** - In the HAM model it is found that there is no limit on the amount to be put for the first year O&M cost. This allows bidders to quote numerous high-low combinations of construction cost and O&M cost. This may lead to same total project cost

for number of bidders and the Authority may receive bids with uncontrolled O&M cost.

- **Clause of Damages for delay attributed to the concessionaire** - If the concessionaire does not fulfill any or all the conditions within 150 days of agreement then he has to pay damages to the Authority for delay. The damages equal 0.3% of the performance security for each day's delay, until the fulfillment of all conditions as stipulated in Clause 4.1.3 of DCA(Draft Concession Agreement) of HAM.

It has been observed that the rate of interest applied which is 0.3% of performance security for each day's delay is more, because for conventional DBFOT projects it was 0.1% of performance security.

- **Financial Closure clause** - In the HAM model, time period given for financial close is 150 days from the date of signing of the concession agreement. In this period, if concessionaire fails to achieve financial closure, it has to pay damages to the Authority. The damages equal to 0.05% of the performance security for each day's delay and that damages should be payable every week in advance [9].

HAM projects worth of Rs 1.18 trillion awarded until July 2018 reveals, only around Rs 580 billion achieved financial closure, due to lack of appetite and lending freeze on many public sector banks, this was reported by one of the agency[15].

- **Release of Performance security** - Performance

security will be released after period of 1 year from the date of appointment or when developer attains 30% of financial progress. Additional performance security will be released after achievement of 75% of physical progress.

In conventional DBFOT project, performance security will be released after period of 1 year or 20% of financial progress is achieved [8].

- **Termination Payment during construction** - During the construction period if projects get terminated due to default of concessionaire, the Authority will pay termination payment to the concessionaire. The termination payment will be based on the payment milestone which is in terms of physical progress made by the concessionaire. The table no II gives clear idea about termination payment during the period of construction

Table II Termination payment during construction period

Payment Milestone	On achievement of % physical progress	Termination Payment
1	10	Nil
2	30	50% of Debt Due or 5.25% of Bid Project Cost , whichever is lower
3	50	60% of Debt Due or 11.70% of Bid Project Cost , whichever is lower
4	75	70% of Debt Due or 24% of Bid Project Cost , whichever is lower
5	90	80% of Debt Due or 32% of Bid Project Cost , whichever is lower

Also, it is clarified in the DCA that, in case of termination happening in between two Payment Milestones, for the purpose of calculation of Termination Payment, the milestone achieved would only be considered.

It is not acceptable as there is huge loss of concessionaire, if project gets terminated when it is near the achievement of next payment milestone.

- **Termination Payment during operation** - In case of default by the concessionaire during the operation period (O&M period) upon termination of project, the Authority will pay the concessionaire. This termination payment will be equal to the 65%

of the sum of annuity payments remaining unpaid, to the concessionaire including interest rate.

This created uncertainty among lenders about getting back their money. In a report, state bank officials said even after project get 40% completed, there will not be any payment to the banks [10].

In addition to the above findings, some other reasons are there which makes HAM unsuitable over long run they are -

- **Large number of unfinished projects and a limited contractor capacity** - In India till now many projects are unfinished. Numbers of projects are awarded after 2015 under HAM has concession period of 15 years, indicates these unfinished projects will goes on increasing. Furthermore, today private players didn't have the funds that they had 10 years back due to the investment made earlier.
- **Land acquisition** - Land acquisition cost increased tremendously during last 5 years. The land acquisition cost is increased from Rs 1.3 crore per hectare in 2015 to Rs 3.2 crore in 2019, has increased NHAI's funding requirements [11]. In India almost more than 34 road projects out of 100 awarded under HAM are stucked due to land acquisition issues. Appointed date is announced by the government only after government secures 80% right of way and financial close is achieved by the private player. After the appointed date is announced, the scheme comes into force and concessionaire is liable to get the mobilization advance. As per reports in end of January, up to 31 December 2019, 4 per cent of projects awarded in FY18 and 95 per cent of projects awarded in FY19 have not received appointed dates [11].
- **Long Concession Period** - HAM has concession period of 15 years, which is too long when compared with the EPC contract model. EPC contract model has contract duration of construction period plus one year O&M period and defect liability period. This open up arms of private player to invest in other project due to short contract period.

IV. NEW PPP MODEL FOR INDIAN ROAD INFRASTRUCTURE

The new PPP model is modification of existing HAM model. The new model tries to overcome the difficulties of existing HAM model.

The salient features of proposed PPP model are as follows -

- Financing agency, mode of finance, construction agency, O&M agency, collected toll all this terms are same as that of HAM model.
- **Concession period of 10 years** - From the questionnaire survey, the concession period of new model is reduced to 10 years. As HAM is combination of BOT (Concession period 20 years) and EPC (generally contract period is less than 5 years), hence this new model is proposed to have a concession period of 10 years. From lender point of view it implies that 'return period of the debt' is reduced. By reducing the concession period in proposed model, the private agency will be free from the agreement earlier compared to the existing HAM model and able to bid for future projects.

Refund of payment to private agency - Like in HAM, 40% of payment will be given as per the project milestone in construction period. In the operation period, balance 60% of project cost adjusted for the Price Multiple Index (linked with both consumer and wholesale price indexes, in the ratio of 70:30) and will be given in 20 biannual installments, during the concession period of 10 years. Implementation of FASTag at toll places will prevent the toll leakages (which was reported 15-20%) and helps in revenue generation of the Authority. This will help to repay the fixed annuity to the concessionaire.

- **Calculation of total project cost** - Total project cost will be calculated based on life cycle costing approach as in HAM but with controlled O&M cost.

Total Project cost =

$$\sum_{k=1}^{10} (\text{NPV of Project Construction cost} + \text{NPV of first year O\&M cost})$$

Where, the first year O&M cost is limited to 3% of bid cost of the project.

In the proposed model during bidding, after carrying out questionnaire survey [12], O&M cost of first year is limited to 3% of bid cost of the project, this lead to get the fair bids from the bidder.

- **Information about Land acquisition in the RFP** - The bid document of new model will include the information of land acquired till the date of inviting bid, in its RFP (request for proposal). This will give the bidders exact information about the project, and accordingly they will show the interest towards the bid. The project in which more land acquisition is

completed will experience more competitive bidding. Also Authority can instruct the State Governments for increase or decrease the rate of land acquisition from the response of the bidders.

- **Clause of Damages for delay attributed to the concessionaire** - If the concessionaire does not fulfill any or all the conditions within 150 days of agreement, then he has to pay damages to the authority for delay. The damages equals 0.3% of the performance security for each day's delay until the fulfillment of all conditions as stipulated in Clause 4.1.3 of DCA of HAM. In new model, the conditions are kept same but damages payable to the authority will be at the rate of 0.1% of performance security for each day based on the responses received from questionnaire survey. This will relieve the financial pressure of the private agency to some extent.

- **Financial Closure clause** - Based on the questionnaire survey, in the new model, time period given for financial closure is increased from 150 days to 180 days from the date of signing of the concession agreement. This is due to the fact that between financial year 2016 and financial year 2018, National Highway Authority of India awarded 90-100 HAM projects, of which only 40% secured financial closure within stipulated time of 150 days [16]. By increasing the time for financial closure; lenders will get time for study of project and take proper decision about financing the project.

- **Release of Performance security** - In the new model of PPP, Performance security will be released after period of 1 year from the date of appointment or when developer attains 20% of financial progress as per conventional DBFOT model [5]. This is based on the responses obtained from the questionnaire survey. This will reduce the financial burden on the concessionaire during the construction period.

- **Termination Payment during construction** - In case of termination happening in between two payment milestones, for the purpose of calculation of Termination Payment, the actual physical progress is measured. Based on the % physical progress the upper and lower milestones are fixed. By doing interpolation, the % of Debt Due or % of Bid Project Cost, whichever is lower will be given as Termination Payment. The milestones and other

things are same as HAM model. This will help to prevent the losses to the concessionaire in case of termination of project between two milestones.

- **Termination Payment during operation** - In case of default by the concessionaire during the operation period (O&M period) upon termination of project, authority will pay the concessionaire with the same provisions as specified in HAM. This termination payment will be made in escrow account by the Authority. Upon termination of the concession agreement, the termination payment cannot be drawn by the concessionaire without approval of lender. The remaining amounts, all standing to the credit of the escrow account shall be appropriated and dealt with the order specified in HAM DCA clause 4.2. This gives surety to the lender to get their money back if project terminates during operation.

Problem of O&M due to reduction in Concession period

In the proposed PPP model, concession period is reduced to 10 years, leads to higher amount of annuity payments to the concessionaire and also lowers the O&M responsibility of the project by 5 years as compared with the HAM model. To overcome this disadvantage of new proposed model, the OPRC model for road maintenance will be used for the roads.

The contractor executes the work as per the direction of the road administrating authority in traditional road maintenance contracts. The payment is made on the basis of unit prices for different work items, he executes. For example contractor will be get paid for each repaired pothole. In many cases, contractor carries out the maximum amount of works to maximize his profit. In output and performance based road contracts (OPRC) model, the contractor gets paid on the output basis. The output is in term of 'service levels' of the road, which is closely related to the physical condition of the road to serve road user. The authority has to define service level in the contract clearly and accordingly contractor has to maintain the service level. In return for achieving this service level, the authority will periodically pay a fixed amount to the contractor. This model saves cost, from 10% to 40% over traditional maintenance contract and it has been proved cost effective in many countries [7].

V. CONCLUSION

The proposed PPP model considers views of all the stakeholders involved in the PPP. By modifying the clauses existing in HAM model related to 'Release of performance security', 'Damages for delay attributed to the concessionaire', 'Termination payment during construction', 'Termination payment during operation' and 'Financial closure clause' the private agencies will get relief from financial burden and lenders are assured about getting their money. The proposed model provides information about land acquisition in the RFP, control on the O&M cost to be quoted during the bidding; these will help to get fair and competitive bid during the bidding procedure. The reduced concession period in the proposed model of PPP will make the stakeholders free from their duties and they will be available again for the bidding of projects in the future. Compared to HAM the O&M period of the proposed model will be less due to the reduction of concession period. This O&M will be carried out by OPRC model, which will lead to considerable cost saving and beneficial for the Authority. The proposed PPP model will be better than the HAM over long run for Indian road sector.

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