

**DEVELOPMENT OF A FRAMEWORK FOR
IDENTIFYING HIGHWAY PROJECTS FOR
PRIVATE-PUBLIC-PARTNERSHIP FINANCING**

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Degree of Master of Engineering

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Sri Lanka

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Thesis submitted in partial fulfillment of the requirements for the degree Master of
Engineering in Highway & Traffic engineering

Department of Civil Engineering

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Sri Lanka

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DECLARATION OF THE CANDIDATE AND SUPERVISOR

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DEDICATION

To all the persons who conduct the research in similar subject and all persons helped me for achieving this project success.

ABSTRACT

Development of a Framework for Identifying Highway Projects for Private-Public-Partnership Financing

In many cases, Public Private Partnership (PPP) projects are looked as skeptical phenomenon due to the involvement of risk factors. However, in order to reduce the financial burden on the government, it is essential to undertake PPP projects. Lack of project prioritization due to the absence of a supporting framework for selecting the infrastructure projects in Sri Lanka was identified as one of the key issues by World Bank for accelerating PPP projects. Therefore, a review was conducted to identify the criteria considered in the selection of road projects in other countries, and to develop criteria that can assist the public and private entities to identify the potential road projects in Sri Lanka. The aim of this research is to develop criteria to prioritize highway project from pipelines for the developments under PPP.

As the first step, criteria which are used by USA (US Department of Transportation, Virginia Transportation, Commonwealth of Pennsylvania), Pakistan, Philippines, and World Bank for selection of PPP projects were collected. Further, Critical Successful Factors (CSF) and reasons for failure of PPP highway projects were reviewed. The importance of these factors in the selection criteria was analyzed. A Multi Attribute Analysis was used in the research. The criteria identified from other countries are subpackaged under Demand, Financial, Risk and Scale categories.

A questionnaire survey was carried out with PPP and highway experts. The ranking of subpackage criteria, top six preferred criteria, and their score by nine respondents were collected. Using Garrett ranking technique, a single criterion was selected from each subpackages and used for development of preliminary screening criteria. Based on the other countries' guidelines, the percentage responses, and scores for the top six preferred criteria, nine criteria were recommended for secondary screening. Financial viability of a project was identified as the topmost criterion to be considered in project screening.

The completed and ongoing 10 expressway projects were considered, and PPP candidate nature of these projects were analyzed based on the secondary screening criteria. Preliminary screening was not carried out for the projects, because no qualifiers were developed in this study to screen out projects. Due to less information availability: financial viability, economic development, traffic congestion reduced from the projects, roles of the road in network and project cost were used for the comparison of projects. Port Access Elevated Highway was received the highest total score from the secondary screening. Major limitation in this study is that there are not any successfully completed PPP road projects in Sri Lanka, to compare our study and the real-world project scenario. In addition, another limitation was the lack of availability of detailed documentation in the projects.

Keywords: Public private partnership, Multi Attribute, Screening criteria, Garrett ranking technique

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ABBREVIATION

BCR	-	Benefit Cost Ratio
EIRR	-	Economic Internal Rate of Return
ENPV	-	Economic Net Present Value
FIRR	-	Financial Internal Rate of Return
FNPV	-	Financial Net Present Value
MCA	-	Multi Criteria Analysis
NAPPP	-	National Agency for Public Private Partnership
NPSV	-	Net Present Social Value
PPP	-	Public Private Partnership
RDA	-	Road Development Authority
O&M	-	Operation and Maintenance
VfM	-	Value for Money

1.0 INTRODUCTION

1.1 Background

After the end of three decades war in the country, the Government of Sri Lanka, (GOSL) has undertaken rapid highway construction projects to increase the connectivity of the country and boost the economy by connecting major cities and economic hubs. As a traditional practice reserves, loan or grant funds are used for the financing purpose. However, when analyzing the debt to gross domestic product (GDP) ratio of Sri Lanka, it has reached a value of 82.9% for the year 2018. Debt to GDP is one parameter looked as one country's ability to payback future payment to the investors. So, increasing Debt to GDP ratio has increased the risk for lender and borrowing in the future will be difficult. Therefore, alternative financing methods should be considered for public investment projects. Public Private Partnership (PPP) is used in many countries and this alternative method can be considered for highway construction financing.

In Economic Policy framework for vision 2025, PPP has identified as part of private participation, as a measure of long-term funding for infrastructures.

1.2 Driving forces to adapt other financing methods

1. With the end of three decades war in the country, the connectivity of the provinces of the country is considered as an important need.
2. Increasing need of infrastructure with the economic development and resulted affordability of private vehicles.
3. Increased cost of construction and related costs increase the gap between availability of funds and requirement of funds.
4. The repayment of loans cannot be covered from low amount of revenues generated from tolls and fuel tax.
5. Access to capital market with low interest rate finance is feasible.

1.3 Problem statement

Selection of viable PPP projects is a critical phase in PPP development and there should be a framework to support the PPP process in the country. One of the key constraints for PPP development in Sri Lanka is over reliance of unsolicited proposals. Not only in Sri Lanka, in many countries there are not any proper guidelines to screen Highway PPP projects. So, it is crucial to identify key factors to develop a screening tool by considering successful practices of other countries.

As the preparation for PPP projects are demanding financial and human resources, it is key to screen good candidate projects for PPP to utilize limited resources. This research will mainly focus on Road projects.

1.4 Objective of the study

Develop a framework to assist identification, selection and prioritization of projects from pipeline to finance under PPP and create a list of viable PPP projects.

Under the main objective, following sub-objectives are identified.

1. Develop Criteria to identify candidate PPP projects
2. Compare completed, ongoing and future projects in Sri Lanka for the viability as a PPP project.

1.5 Outline of the report

This chapter expressed the problem statement, background of the research and purpose of this research. The next chapter mainly covers the practices and guidelines available in other countries in PPP project selection.

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter consists of extensive look at the literature review regarding the research subject. The necessity of the PPP, the extent of PPP in Sri Lanka, PPP screening methods in other countries and success' and failures of Highway PPP projects are the major points that were analyzed for this literature review.

2.2 Public Private Partnership

2.2.1 Features of the PPP structure

The PPP structure has unique characteristics compared to other financing methods. Involving private partners would achieve cost savings in design, construction, operation and maintenance. Furthermore, private parties can add technological and managerial innovation to projects. For examples High Occupancy Toll (HOC) is added as an innovative tolling method in many PPP projects in USA (Guidebook on Financing of Highway, December 2016).

Risk transfer to private parties is considered as one of the key features of PPP compared to traditional financing methods. Since the private entity is responsible for the delivery of the project, a major risk can be transferred from public in this manner. Formation of a contract that covers all the foreseeable issues between parties enables better transfer of risk. When the scope of the project increases, more risk can be transferred from public party to private concessionaire. Public entity prefers to utilize the experience from the private party to form PPP methods. For example, in some projects where the government has no or few experiences in that particular kind of project, experienced private party may reduce the risk to a greater level while efficiency also can be achieved from PPP delivery method. However, it is not possible to transfer the full risk to private parties as it defeats the PPP concept.

Figure 2.1 below illustrates the project cycle of PPP projects.

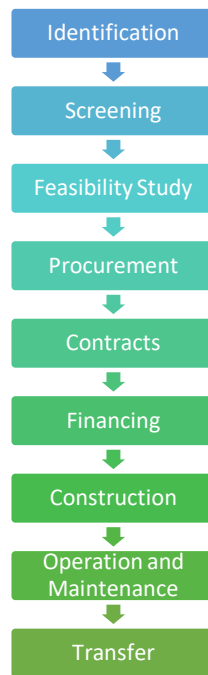


Figure 2.1 PPP Project cycle

2.2.2 PPP Models

There are different varieties of PPP models available. Based on the risk sharing nature, the appropriate model of the project can be selected. Figure 2.2 used to express the private party involvement and risk transfer in PPP models (Guidebook on Financing of Highway, December 2016).

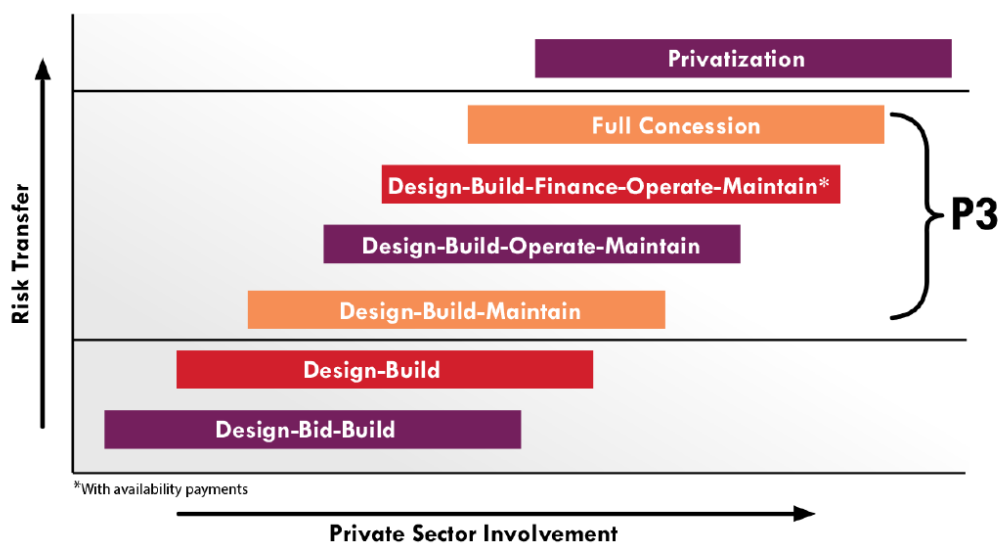


Figure 2.2 PPP Model selection.

Note: From Guidebook on Financing of Highway, 2016, p. 2-5 U.S. Department of Transportation.

The potential benefits and losses of PPP models should be analyzed. The four major types are as follows,

1. Build, Operate, Transfer (BOT)
2. Design, Build, Finance, Operate (DBFO)
3. Design, Build, Finance, Maintenance (DBFM)
4. Design, Build, Finance, Operate, Maintenance (DBFOM)

Benefits and losses of these PPP models are summarized in Table 2.1 (Maslova, 2016).

Table 2.1 Benefits and losses of PPP models

	Benefits	PPP Model	Losses
Private Partner	<ul style="list-style-type: none"> • Ownership of the road • Road can be used as an asset in Collateral agreements 	BO(O)T	<ul style="list-style-type: none"> • Traffic risk for the private party
Public Partner	<ul style="list-style-type: none"> • Traffic demand risk allocation to private party • Less financing requirements 		<ul style="list-style-type: none"> • Restricted participation in operation and management
Private Partner	<ul style="list-style-type: none"> • Long-term business with secured fee 	DBFM	<ul style="list-style-type: none"> • High risk bearer
Public Partner	<ul style="list-style-type: none"> • Public ownership of the land • Transfer of project risks to private partner • High level of agreed services to public 		<ul style="list-style-type: none"> • Public partner loses user fee from the road • Investment compensation cost is still with public partner

Private Partner	<ul style="list-style-type: none"> • Better toll management to achieve high revenue • (other all benefits from DBFM) 	DBFO	<ul style="list-style-type: none"> • Revenue risk to private partner • Public partner monitoring and control
Public Partner	<ul style="list-style-type: none"> • Better control over private party (other all benefits from DBFM) • Involvement in various stages of management of road 		<ul style="list-style-type: none"> • Continuous monitoring is essential
Private Partner	<ul style="list-style-type: none"> • In addition to DBFM, DBFO benefits, Financial incentives for private partner 	DBFOM	
Public Partner	<ul style="list-style-type: none"> • In addition to DBFM, DBFO benefits, higher Key Performance Indicator in operation 		

2.3 History of Public Private Partnership in Sri Lanka

PPP projects have been in use for nearly two decades in Sri Lanka. It is a tried, tested, and successful method in Sri Lankan power sector. Interestingly, there are not any PPP failure projects in Sri Lanka if it reaches the implementation stage (Marian, 2019).

2.4 Current Stage of Public Private Partnership in Sri Lanka

2.4.1 Project Identification

List of projects given below were identified from Public Investment Programme (PIP). Affordability of Government of Sri Lanka (GOSL) and fiscal scale of the government is evaluated. Due to the limited capacity, projects which bring social, economic and financial benefits will be chosen. Based on the affordability, it can be;

- Directly funded- consolidate project development (Budget)
- Finance as from donor funds. E.g: ADB, JICA, World Bank

- If above not affordable, it will be considered as PPP

So, any projects which are not funded by either directly or with donor fund will be considered as a candidate for PPP.

Many of the projects in the pipeline are included by cabinet. For projects requested by line ministry, decision will be made after analyzing EIRR, social and economic benefits.

The fiscal scale of the government is dependent on the GDP. So, to improve the fiscal scale, GDP should be improved. In the fiscal scale constraint, lucrative investment should be identified, where the risk sharing partners should be attracted to invest.

Solicited Project vs Unsolicited Projects

In Sri Lanka, the projects proposals are mainly included by Cabinet as mentioned above, and these proposals are called as Solicited Proposals. Unsolicited proposals are where the proposal is initiated by the private parties. But as per the government guidelines in government tender procedure, Swiss challenge method is used. In Swiss challenge method, Request for Proposals (RFP) will be issued by government and other proposals are also considered to make sure that the efficient proposal is selected.

2.4.2 PPP Projects Selection Methods

In Sri Lanka, the NAPPP uses 2 step process for screening projects. In the first step the following 5 filters are used to short list the projects (Redup, 2019).

1. Project readiness filter: In this the level, preparation of projects is considered.
2. Investment cost filter: The project cost of the project should be at least USD \$ 50 million. Projects with small costs are bundled together.
3. Public Investment Plan filter: Here the inclusion of the projects in GoSL investment plans such as NPD Public Investment Program, budget estimates, Line-ministry-level plans are considered.
4. PPP definition filter: It is made sure that country's PPP guidelines are met with the considered project.
5. Sector exclusion project: In this filter, the sector of the project is reviewed with PPP policy/Guidelines.

Figure 2.3 illustrates the stages of filters used in PPP list creation in first step of selection (Redup, 2019).

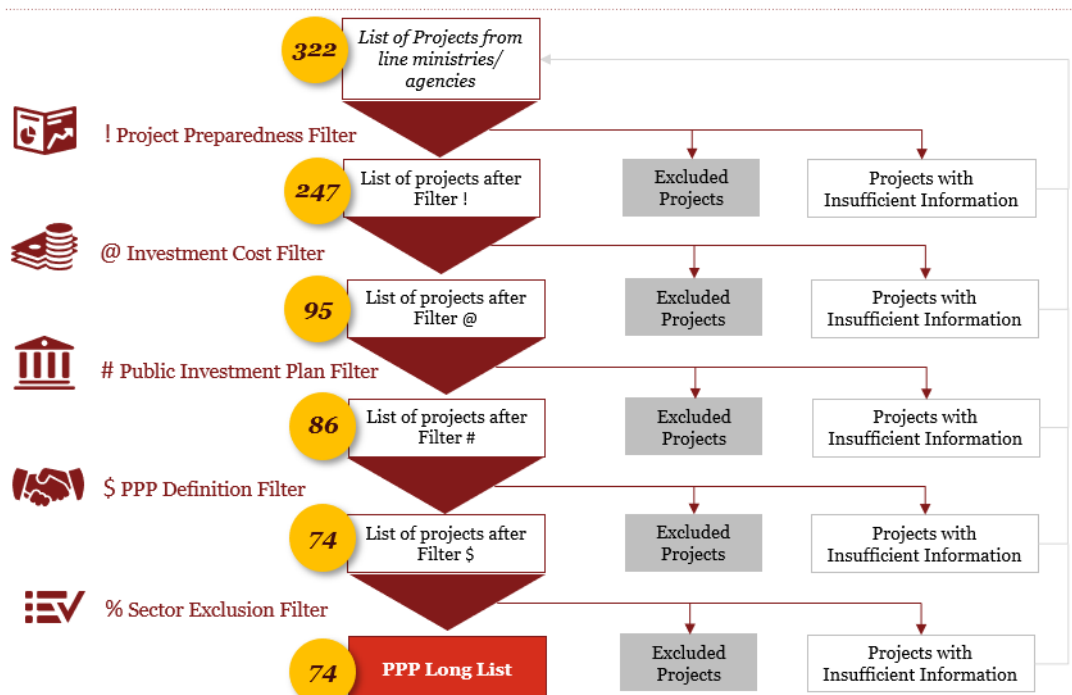


Figure 2.3 PPP Selection filters used in Sri Lanka by NAPPP

Note: From Identification, Selection and Prioritization of PPP projects. Streamlining the implementation of PPP. Redup, 2019.

The PPP long list, which is the output of these five filters are further analyzed with 9 criteria and the lowest scored projects are removed from the list.

The following 9 criteria are used for the second step of project screening.

1. GoSL Priority: Prioritized projects are given higher score than non-prioritized projects.
2. Management/ Technical gaps and service levels: Projects where the line ministry is having gaps in managing the projects are given higher score.
3. Line Ministry Readiness: The prior experience in PPP of the line ministry is given higher score
4. Status of Project Preparation: Projects which are having high level of preparation are given high rank compared to projects in preliminary stages.
5. Project implementation timeline: Less complex projects in terms of land acquisition, project issues, rehabilitation and resettlement are given higher score.

6. Project Feasibility: Projects with high feasibility in terms of financial, economic, social, and environmental are given high scores.
7. Financing: Projects which requires low level of funding from Government and certain in banking are given higher scores.
8. Private Sector Appetite: Here, interest of the private sector is considered and given higher ranks.
9. Availability of information: Projects with high information availability are given higher scores.

As a key step, Value for Money (VfM) analysis is conducted for projects. So, public sector comparator and shadow bid model, if the project undertaken by government scenario vs private sector scenario is compared. The benefits from conventional scheme and PPP scheme are given in Table 2.2.

Table 2.2 Benefits of PPP and conventional projects

Benefits: If the project undertaken by Government	Benefits: If the project undertaken by Private Parties
<ul style="list-style-type: none"> • Borrowing rate is low • More control in the highway asset 	<ul style="list-style-type: none"> • Borrowing rate is high • Efficiency is high • Competitive nature • Notional Cost-VAT from the Private party can be taken

2.5 Screening of Projects for PPP development

In order to identify criteria for selection of road projects for PPP development, criteria which are considered for the similar purpose are analyzed. In this section, many guidelines are compared.

2.5.1 User Guidebook on Implementing Public Private Partnership for Transportation Infrastructure Projects in the United States by U.S. Department of Transportation

In this guideline criteria looked by both public and private parties are individually discussed. For the research only projects related selection criteria are considered as below.

Project-Based Criteria for Selecting PPP Approaches

1. Demand

- Necessity of the project to solve the transportation requirement
- Economic development from the project
- Public support for PPP method
- Political support for PPP method for financing
- Presence of project in highway development plans

2. Project Scale

- The size and fund requirement of the project
- Complexity of project design
- Functional scope of the project
- Public agency funding capacity for financing
- Risk tolerance of the public party for large projects.

3. Project Stage and Risk Profile

- Ability to achieve value maximization and cost minimization from projects.
- Public party participation in land acquisition and environmental clearances
- At least 30% optimization of good practices from project design
- Transfer of significant Operation and Management risk to private team
- Greater risk from the project beyond Public agency's risk tolerance.

4. Project Revenue and Funding Potential

- Limited Public agency fund in sponsoring transportation projects.
- More funding opportunities from favorable user pricing
- Legal infrastructure to support private financing
- High cost and financially favorable project require alternative funding methods.

2.5.2 Public and Private Sector Roles in the Supply of Transport Infrastructure and Services - Transport Papers– TP1 (Amos, 2004)

Three stages of screening process are mentioned in the transport paper.

1. Initial Project Screening: Project Objectives

- Significant economic development from the project
- Government plans to utilize private partners capabilities and financing
- Ability of private partner to take risks
- Projects satisfying environmental requirements

2. Subsequent Screening: Practicality

- PPP supporting environment in the country
- Government support to private financing by necessary industrial controls
- User fees to takeback at least part of the cost from projects.
- Capability of public agency in management of project
- Government willingness to hire PPP experts
- PPP history in the country
- Successful PPP projects in the sector in other nations
- Continuous support from the government for PPP
- Better procurement practices in the country
- Regulations to achieve PPP goals
- Private sector interest in financing project

3. Final Screening: Value for Money

- Value maximization than public funded method
- Financial viability of the project after sensitivity analysis
- Less burden on government funding in sustainable manner

2.5.3 Toolkit for Public Private Partnerships in Roads and Highways by Public-Private Infrastructure Advisory Facility

This guideline helps to screen projects which provides VfM to be the ideal candidates for PPP. The following criteria can be used to evaluate the projects. As first step a need analysis will be carried out, to confirm the need of the project in terms of technical and economic rationale, availability in the government pipeline and project support from relevant stakeholders.

Figure 2.4 explains the procedure to select the project from Pipeline using criteria (Toolkit for Public Private Partnerships in Roads and Highways, 2017).

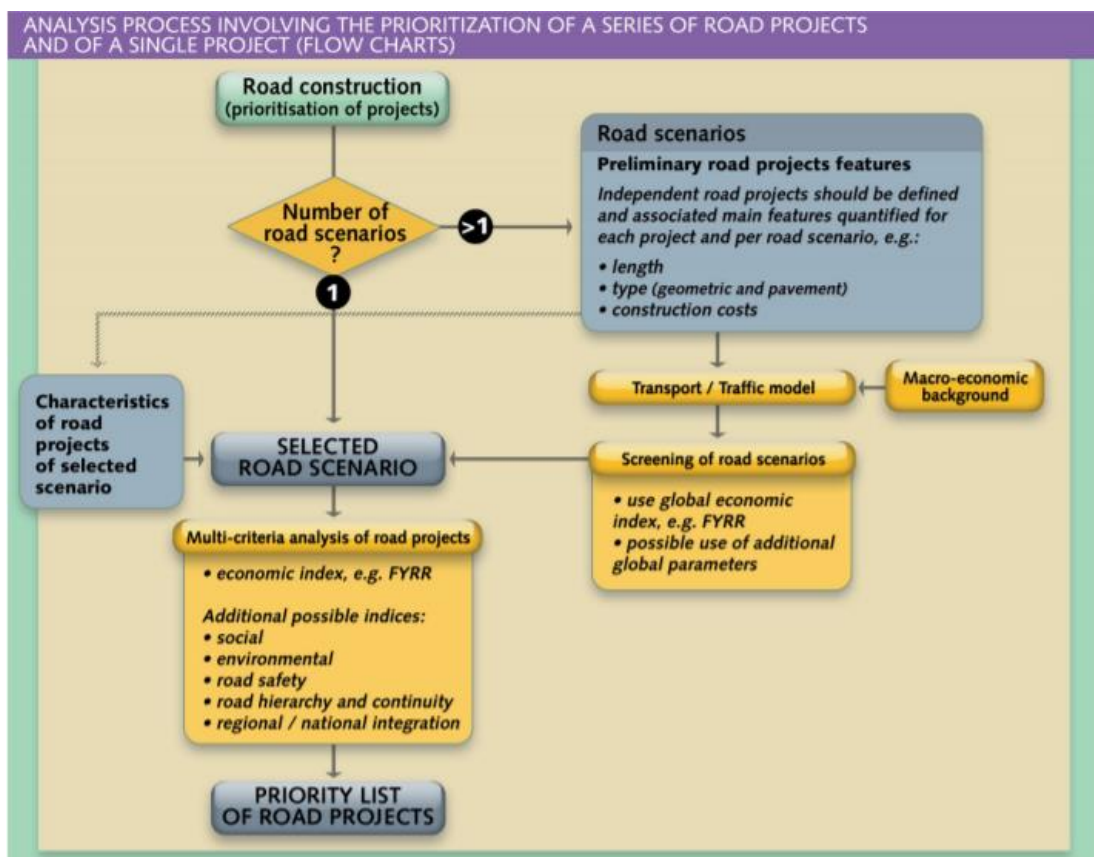


Figure 2.4 PPP project selection procedure

Note: From Selecting PPP Projects, Toolkit for Public Private Partnerships in Roads and Highways, 2017, p.9, Public Private Infrastructure Advisory Faculty.

This guide suggests 12 criteria for PPP selection of highway projects.

1. Financial viability and fiscal support: Objective simple financial model in the Toolkit or subjectively
2. Readiness and risk: Overall summary risk assessment and ‘readiness’
3. Socio economic benefits: Social and economic benefits
4. Regional development: Contribution to GDP and regional impact plus expressed local need/support
5. Sector network role importance in sector plan: Role in sector strategy
6. National Integration and Security: Whether project assists national integration and security
7. Land acquisition: Extent of land acquired
8. Environment/Resettlement: Environmental and resettlement issues
9. Impact on export earnings: Export earnings focused project
10. Safety: Specific safety objectives
11. Project type/cost: Project description (relatively brief, including approximate project cost) and whether a ‘new build’ project
12. Demand: Trends, volume and the demand/capacity ratio

2.5.4 Project Preparation/Feasibility Guidelines for PPP Projects by Ministry of Finance- Government of Pakistan

The government of Pakistan consider the following factors, while screening the PPP projects.

Value for Money

- Scale of the Project: Sufficient cashflow from the project
- Output Specification: Output related payment mechanism
- Opportunities for Risk transfer: Risk transfer to private partner
- Market capability and appetite: Demand for the project with financial viability

Social and Environmental Factors

- Legal part: Existence of legal party to handle environmental and social issues arising from the project
- Approval for Projects: Environmental and other clearances need to be completed in short time
- Capacity of the Institution: Ability of the public institute to safeguard environmental effects from the projects
- Effective and Functional Cooperate Governance: This influences environmental approval and social organization
- Ready to access the project site: Site issues and risk should be taken by public entity
- Institutional Internal Environment Management: To minimize the environmental risks

From pre-feasibility study, screening of projects can be done. Following assessments need to be carried out for the screening of projects.

- Technical and operational feasibility of the project concept
- Environmental and social assessment
- Financial and economic feasibility of the project
- Practical arrangement for PPP participation

By carrying out these assessments, relevant factors such as project cost, risks, revenue generations, environmental requirements, financial and economic viability, social

mobilizations, project scope, private party opportunities and project preparations will be identified.

2.5.5 Project Screening and Selection of Priority PPP Projects in Philippines

Philippines has a common guideline named “Guidelines on the identification, selection and prioritization of Public Private Partnership (PPP) Project”, where it describes the selection of projects from the pipeline. Figure 2.5 below illustrates the common procedure to select a PPP project. Multi Criteria Analysis (MCA) tool is used to screen projects. Even if, projects fail to be selected from MCA, further analysis is conducted to analyze the viability of the project (Guidelines on the identification, selection and prioritization of Public Private Partnership (PPP) Project, 2015).

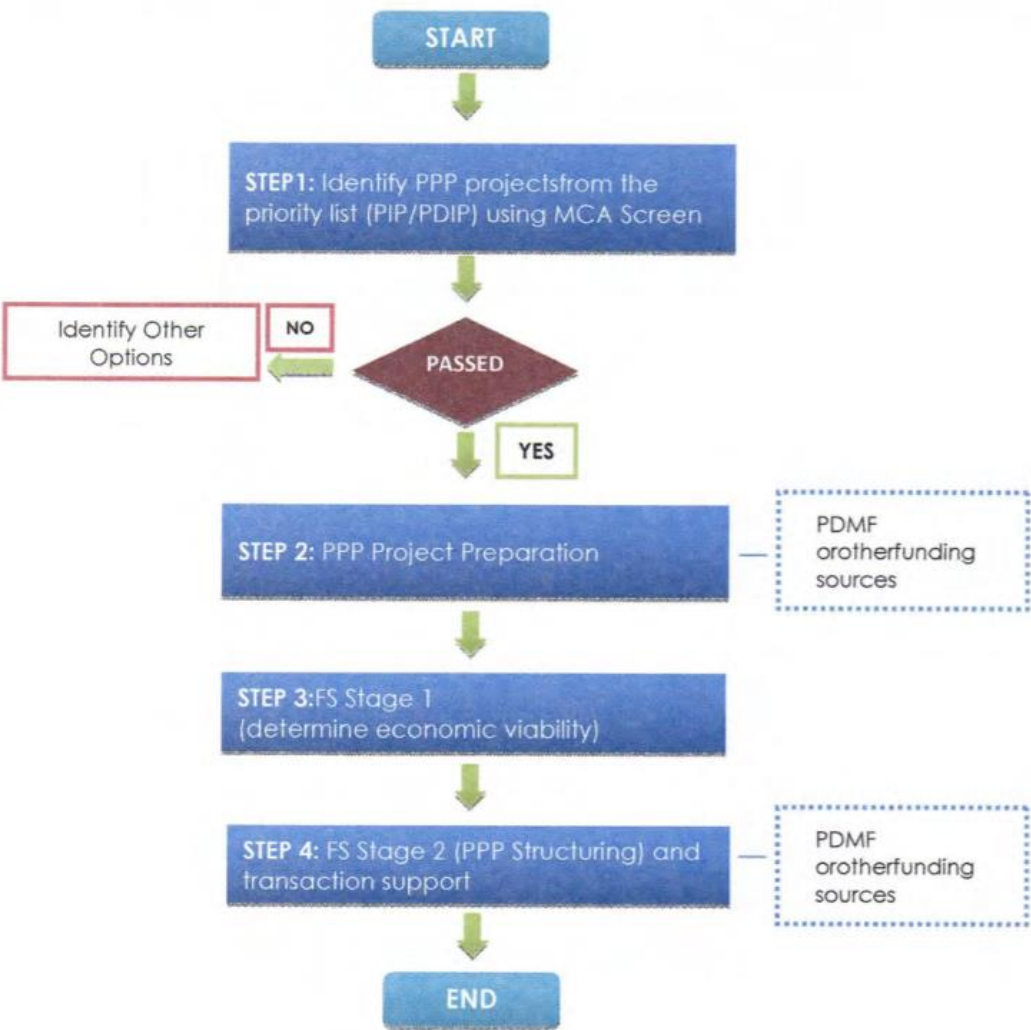


Figure 2.5 PPP project selection in Philippines

Note: From (2015). Guidelines on the identification, selection and prioritization of Public Private Partnership (PPP) Project. Philippines, 2015, p. 4. Public Private Partnership Centre.

This section further guides regarding the different kinds of analysis and indicators to be considered in PPP project screening.

1. **Economic Analysis:** The Net Present Value of economic benefits, the Net Present Social Value of the social benefits, Benefit Cost Ratio and Economical Internal Rate of Return (EIRR) are used to analyze Economical and Social benefits in this stage.
2. **Financial Analysis:** This analyzes the financial attractiveness of the project for the investors. Financial Internal Rate of Return (FIRR) and Net Present Value of cashflows from the projects are used in the analysis.
3. **Risk Analysis:** Uncertainties in the projects are covered in this stage. Monte Carlo Analysis, Sensitivity Analysis and probability distributions models are used in this stage to analyze the future risks.
4. **Technical Analysis:** Technical problems in investment, construction, operation, and maintenance are analyzed in this stage. Qualitative parameters used as indicators in this stage.
5. **Market Analysis:** The demand of the project is evaluated in this analysis. The anticipated prices for the outcome can be determined.
6. **Environmental Analysis:** The project impacts on environment can be evaluated.
7. **Stakeholder Analysis:** The financial return from the project and its impact to shareholders are calculated in social analysis.
8. **Institutional Analysis:** The capability of the human resources to handle a PPP project can be assessed in this analysis.
9. **Value for Money Analysis:** Relative cost and benefits of alternative projects can be evaluated using VfM analysis tool.

2.5.5.1 Procedure used to Screen PPP

The procedure used by Philippines government for highway PPP identification, screening, and prioritization is shown in Figure 2.6.

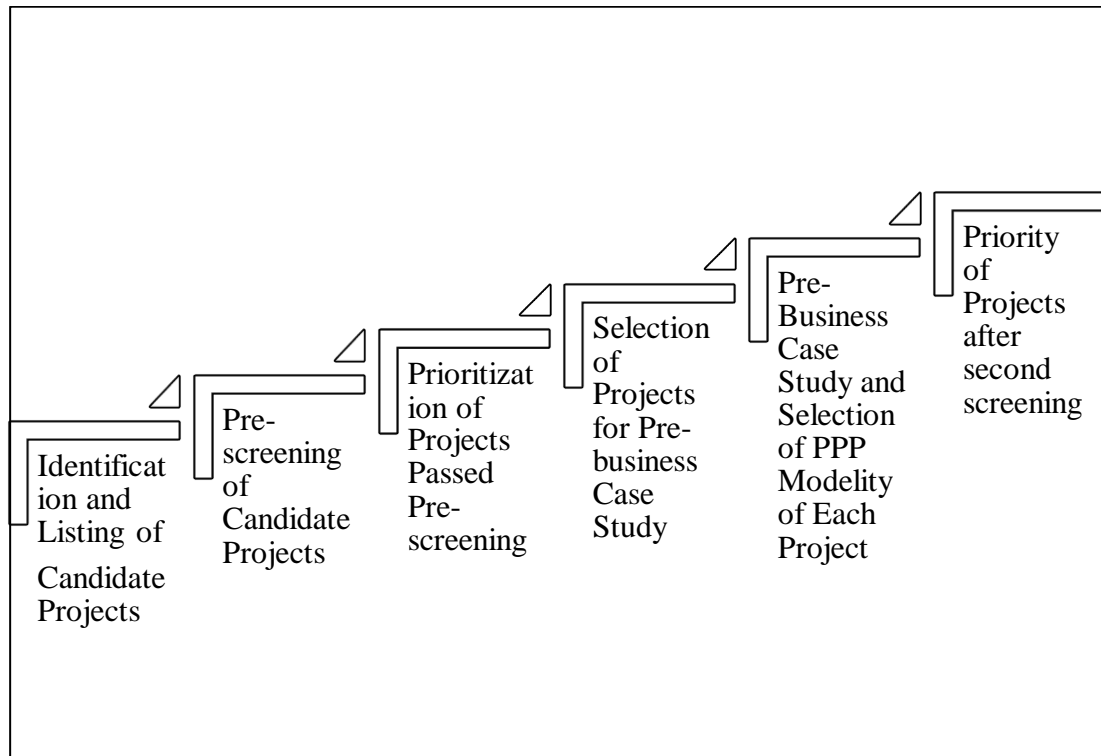


Figure 2.6 Two stage PPP highway project selection in Philippines

Pre-Screening Criteria to screen out Projects

1. Under operation or ongoing project
2. Low traffic (<3000 ADT per day)
3. If the same traffic is already catered by more than three projects and project is costly due to long tunnel and viaduct
4. Right of way acquisition issues
5. Projects consist of long tunnel or an under-sea tunnel over 10 km

Prioritization Criteria for First Screening

1. Functional significance of a link in network and improvement of inter-modal linkage
2. Urgency of the project to reduce traffic congestion

3. Project readiness
4. Contribution to national, regional, socio-economic development
5. Initial investment capital required
6. Environment and social impact
7. Impact of project on revenue of existing toll roads
8. Economic and financial viability

Prioritization Criteria for Second Screening

The secondary screening criteria used by Philippines are shown in Table 2.3.

Table 2.3 Second stage screening criteria in Philippines

Category	Criteria	Indicator
Necessity and urgency of the project	Economic viability	EIRR (%)
	Functional importance of the road	Functional classification
	Contribution to national/regional economic development	Existing and prospective industries along the corridor
	Contribution to national/regional social development	Poverty alleviation from the project
	Urgency of the project to decongestion	Reduction of travel time in PCU-hour/day
	Project readiness	Current project status
	Special purpose company's profitability	Special purpose company's IRR
	Equity investor's profitability	Equity investor's IRR

Profitability	Relief of government's financial burden	Amount of cost saved by the government
	Potential project cost risk	
	Potential project revenue risk	
Implementability	ROW acquisition difficulty	Land area to be acquired by land use
	Social impact	Numbers of structures to be affected
	Natural environment	Pass near environmentally critical area
	Construction difficulty	Type of work required

2.5.6 Providing for Public Private Transportation Partnerships Implementation Manual & Guidelines

This manual is published by the Commonwealth of Pennsylvania to assist the PPP projects. In this manual detail process is described for both solicited and unsolicited proposals. For solicited proposals high level screening and details screening process can be used, whereas for unsolicited proposals, another set of high-level screening and details screening is used (Providing for Public Private Transportation Partnerships, January 9, 2013).

In high level screening, following factors are looked for in selection of PPP projects.

1. Potential to reduce public fund
2. Potential for revenue generation
3. Ability share risk in cost efficient manner
4. Private party capability to reduce complexity of the project
5. Technical feasibility
6. Financial feasibility

7. Ability to meet government policies, economic and transportation development, and environmental goals

For solicited proposals, demand analysis, financial viability, environmental standard meetings, and best value analysis are analyzed further to high-level screening. For unsolicited proposals, the following evaluation criteria are used.

1. Cost
2. Price
3. Financial commitment
4. Innovative financing
5. Bonding
6. Technical, scientific, technological or socioeconomic Merit
7. Financial strength and viability
8. Design, operation, and feasibility
9. Ability of the transportation project to improve economic growth, to increase capacity or to expand an existing transportation facility
10. The compatibility of the proposal with existing local and regional land use plans
11. The commitment of local communities to approve land use plans in preparation of the transportation project
12. The reasonableness of the private entity's proposed project scope and schedule assumptions and projected receipt of public funds, if any, based on a review of applicable Federal and Commonwealth requirements
13. Other factors deemed appropriate by the PPP office and the public entity
14. Further, in addition criteria looked in solicited proposals, best value analysis is carried out for unsolicited proposals

2.5.7 Virginia Transportation PPP guidelines

The following criteria in policy level and detail level are used to select PPP projects. In policy level review, the following criteria are used (High Level Project Screening Report, 2019).

1. Public transportation need satisfied by the project
2. Priority of the project in state, regional or local transportation plan
3. Interference with existing and planned transportation system
4. Sufficient level of development for competitive procurement process
5. Efficiency of less costly than traditional method
6. Consistence with federal requirement
7. Funding requirement
8. Ability to raise funding for the project

In detail review, the following criteria are used to screen candidate projects (Detail Level Project Screening Report, 2019).

1. Public need such as congestion, safety, new capacity, and preservation of existing asset achieved by project
2. Public benefits
3. Economic development
4. Market demand for the project
5. Stakeholder support for the project
6. Legislative consideration (Tolling rates, user charge and public fund)
7. Technical feasibility of the project
8. Environmental feasibility of the project
9. Systematic interference and capability
10. Financial feasibility
11. Legislative feasibility
12. Project risks

13. Life cycle management required by the project

2.6 PPP Projects Assessment Models

2.6.1 Public Sector Comparator

Public Sector Comparator (PSC) is used to analyze the VfM from private investment proposal compared to the most efficient form of government procurement. It estimates the **hypothetical risk-adjusted cost** if a project were to be financed, owned and implemented by government (Kerali). In other terms, using Public Sector Comparator model, what is the cost that will be incurred if the project is carried out in best possible manner.

2.6.2 Shadow Bid Model

This is the hypothetical estimation of bid price of private party based on the capital structure and payment terms. In this model, project benefits and cost are analyzed in private party point of view. This can also be considered as PPP financial assessment model.

Figure 2.7 below describes the VfM assessment method described in US (Guidebook on Financing of Highway, December 2016).

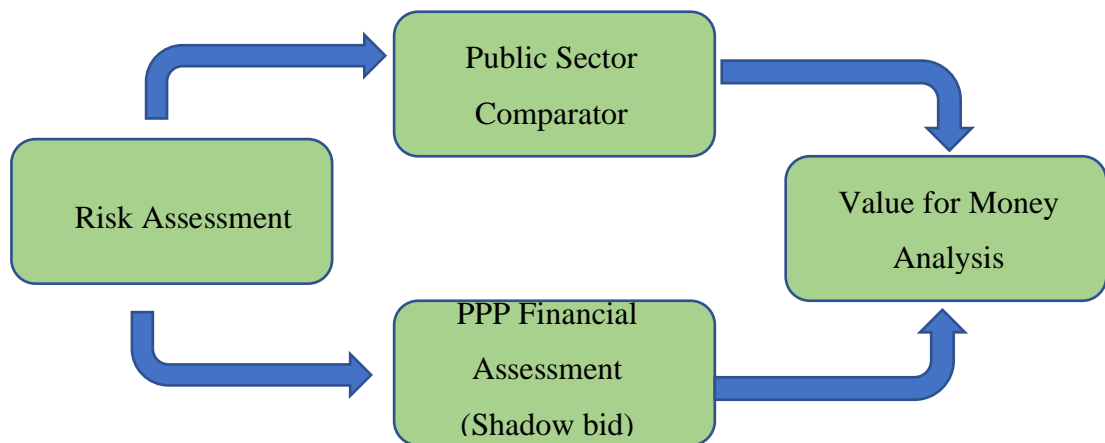


Figure 2.7 Value for Money analysis assessment

According to the guideline, for the initial screening of project, financial viability can be determined. When the projects cannot be fully financially viable, as a next option grants can be justified by analyzing the economic benefits of the project either using Economic Internal Rate of Return EIRR or Benefit Cost Ratio. Financial feasibility

will be further analyzed for the initially screened projects in later stages by conducting analysis by VfM or other tools (Guidebook on Financing of Highway, December 2016).

2.6.3 Net Public Expenditure Reduction Estimation

Net Public Expenditure Reduction (NPER) is used in Philippines to analyze the PSC vs PPP life cycle cost for the government (Preparatory Survey for Public-Private Partnership (PPP) Infrastructure). Figure 2.8 is used to illustrate the cost and revenue to be incurred for the government when it is carried out by the conventional scheme and PPP scheme.

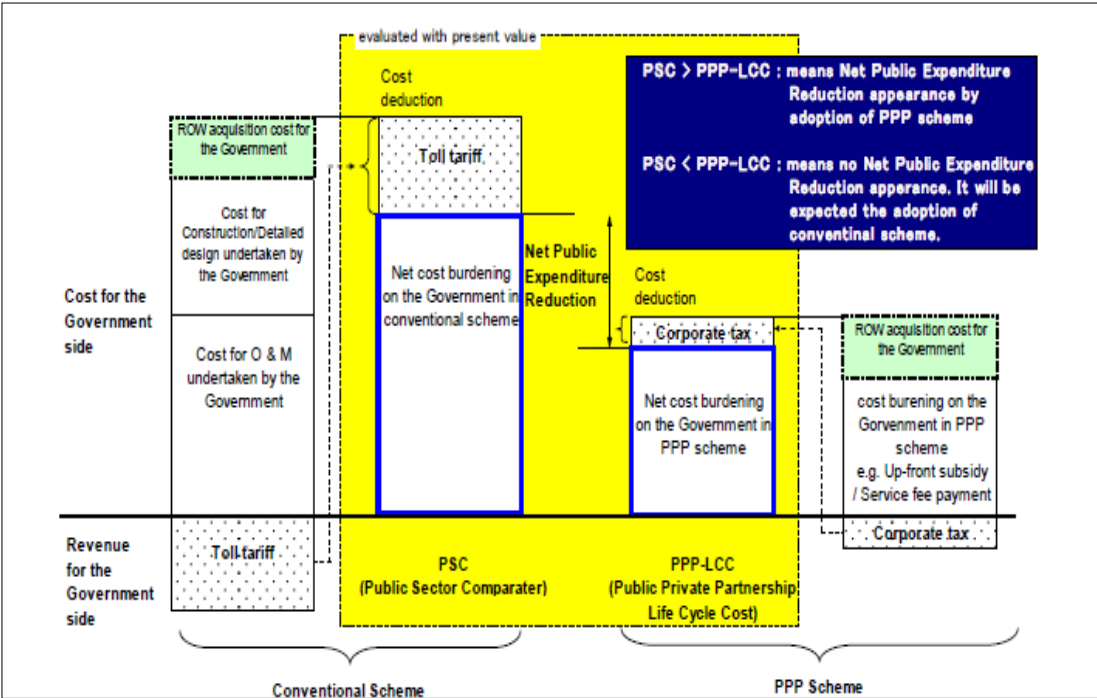


Figure 2.8 Net Public Expenditure reduction estimation by Philippines

Note: From Preparatory Survey for Public-Private Partnership (PPP) Infrastructure, p.59.

2.7 Critical success factor for Successful PPP Projects

The critical success factors for PPP projects were identified in many researches. Effective Procurement, Project Implementability, Government Guarantee, Favorable Economic Conditions, Available Financial Markets are key attributes for PPP success (Hardcastle, Edwards, & Li).

1. Strong private consortium - Project Implementability
2. Appropriate risk allocation and risk sharing - Project Implementability
3. Competitive procurement process - Effective Procurement
4. Commitment/responsibility of public private sector - Project Implementability
5. Realistic cost/Benefit Assessment -Effective Procurement
6. Project technical feasibility - Project Implementability
7. Transparency in procurement process- Effective Procurement
8. Good governance - Effective Procurement
9. Favorable legal framework - Project Implementability
10. Available financial market - Available Financial Markets
11. Political support
12. Multi benefits objectives - Government Guarantee
13. Government involvement by providing guarantee - Government Guarantee
14. Sound economic policy - Favorable Economic Conditions
15. Stable micro-economic environment- Favorable Economic Conditions
16. Well organized public agency - Effective Procurement
17. Shared authority between public and private sector -Effective Procurement
18. Social support - Effective Procurement

In a research conducted by Virtuosity Consulting firm, Canada on Successful examples on PPP in Transportation the following findings are mentioned as key factors for success of PPP (Stambrook, 2005).

1. Adequate debate of project design
2. Competition in procurement process
3. Transparency in procurement procedure and conditions
4. Establishment of dedicated project management unit on behalf on government.
5. Concession length of 30-35 years are suggested as optimal
6. Matters regarding the contract conditions and other issues should be solved in the initial stages of the project
7. PPP projects bankability from toll revenues should be analyzed and plans should be developed for all possible scenarios
8. Traffic risk should be shared with private party and not fully taken by government.

In India, the following reasons are identified as key success factors for transportation PPP Projects success (Nallathiga, Shaikh, Shaikh, & Sheik, 2018).

1. Encouraging investment environment
2. Economic viability
3. Reliable private partners with technical ability
4. Sound financial benefits
5. Proper risk allocation (this can be achieved through contractual arrangements)

2.8 Failure of PPP Projects

It is crucial to identify reasons for PPP failures in developing screening criteria. As part of the research, failure cases of highway PPP Projects and reasons for failure were analyzed.

Reasons for unsuccessful project identified by UNICEF (Maslova, 2016) are as follows.

1. Lack of information of PPP models
2. Lack of information of PPP payment methods
3. Uncertainty in traffic forecasting
4. Risk allocation

In another study, the following challenges identified in traditional PPP contracts. Low population in many cities makes PPP projects as less lucrative, scarcity of land in urban area, slow monetization of land and absence of tariff (user charges) (Agarwal, 2015).

Some PPP failure projects from other countries are analyzed with their reason for failure. In Australia, East West Link (EWL), 18km toll road in Melbourne agreement was signed by the previous government and with the change of the government the contract was terminated. This caused cost of \$1.1 billion loss for the country (Verweij, 2017).

In India, many road PPP projects have failed and the reasons for some failure projects are analyzed by Reddy and Sharma (Reddy & Sharma, April 2017).

One of the roads Chandhikole – Paradip (NH 5A), has failed because of neglect of new rail which is proposed and its impact on traffic. Eventually traffic numbers are not enough to make the project viable and the proposal was dropped later.

Another case, in Angul - Sambalpur (NH 42) project, 80% of the trace required forest clearance and clearance delay significantly affected the project. Furthermore, the loss of expected number of heavy traffic vehicle, project cost escalation and terrorism activity made the project a failure.

Madurai- Ramanathapuram (Section of NH-4) road proposal was abandoned due to no future regional growth, influence of alternative route in traffic volume and less attraction of trucks.

The land acquisition, resettlements, material and labour cost overrun are identified as key issues in implementation of PPP projects in India (Nallathiga, Shaikh, Shaikh, & Sheik, 2018).

In case of Nigeria, Lekki Toll Road Concession Project was the first ever PPP Highway project in Nigeria. This project was affected with protest by locals lead to suspension of tolling, good stakeholder analysis was not conducted before approving the project and poor contract management, for instance, 70% the cost which was allocated for the total project was used in the first four years with 30% of physical infrastructure. (Arimoro, 2017). In Nigeria, the following reasons are identified for the failure of PPP highway projects (Oyedele).

1. Corruption
2. Paucity of Fund
3. Policy instability and somersault
4. Lack of sound legal framework
5. Deficient and ineffective costing
6. Institutional framework
7. Lack of holistic view of national goals
8. Attitude of the public to government projects

2.9 Similar Research Based on Criteria

In order to develop a methodology for the research, similar research on PPP were referred and criteria used in decision making are studied.

In a research by Zhang (Zhang, Concessionnaire Selection : Methods and Criteria, April 2004) to select concessionaire, criteria method is used. The research methodology started with literature review where articles, online databases and World Wide Web were used to gather details. Further case study method used to study international principles. Finally, a questionnaire survey was carried out from 46 respondents from different countries to validate the criteria. The Pearson correlation method used to identify relationship between financial criteria in that research (Zhang, Criteria for Selecting the Private-Sector Partnerships, June 2005).

Another research conducted by Levi (Levy, 1996), criteria used in evaluation of BOT roads in California for the selection of private partner for the road development.

In another research by Blackwell (Blackwell, 2000) the following criteria are found to be used in evaluation of PFI projects in U.K.

1. Innovation
2. Compatibility with operational approach
3. Deliverability
4. Flexibility
5. Risk transfer

2.10 Score and Weightage Values Used in Highway PPP Evaluation

Various institutions have suggested weightages for selection criteria. The following Table 2.4 illustrates score values suggested by Public Private Infrastructure Advisory Faculty (Toolkit for Public Private Partnerships in Roads and Highways, 2017).

Table 2.4 Criteria and weightages suggested in toolkit

	Criteria (Maximum score 10, minimum score 0)	Score 10-8	Score 7-4	Score 3-0
1	Financial feasibility / Fiscal support	If FIRR >20% with no fiscal support	If FIRR >14% with no fiscal support	If FIRR <14% with high fiscal support
2	Readiness and risk	If few major issues and project is ready	If major issues identified can be mitigated and project can be made ready	If many risks and few risks can be mitigated, project is not ready
3	Economic feasible	If EIRR > 15%	If <12%EIRR<15%	If EIRR <12%
4	Regional development	Impact low GDP province and high poverty alleviation	Impact mid GDP province and medium poverty alleviation	Impact high GDP province and low poverty alleviation
5	Network role importance and sector plan	Project creates integral part and	Part of the sector plan	Not included in sector plan

		already in the sector plan		
6	National integration/ National security	Strengthens national security/integration	Mid impact	Low impact
7	Land acquisition	Land acquired >80%	25% <Land acquired < 80%	Land acquired <25%
8	Environmental impact	Low impact and few issues	Mid impact and some issues	Severe impact and high issues
9	Resettlement	Few affected	Mid affected	Many affected
10	Impact on export earnings	Major impact in export or tourism	Limited impact in export or tourism	Little impact in export or tourism
11	Safety	High focus	Medium Focus	Little Focus
12	Project cost	>USD 100 million	USD 50 million to USD 100 million	<USD 50 million
13	Traffic volume Capacity ratio	>20,000 vehicle per day >1.2	10,000 - 20,000 vehicle per day 0.8 – 1.2	<10,000 vehicle per day <0.8
14	Demand growth	>15% per annum	5%-15% per annum	<5% per annum

Weightages can be given to each criterion. If no weightages given, then all the criteria will be given equal importance.

In the guide developed for Identification, Selection and Prioritization by Philippines the following weightages in Table 2.5 are suggested (Guidelines on the identification, selection and prioritization of Public Private Partnership (PPP) Project, 2015).

Table 2.5 Evaluation criteria with weightages used in Philippines

	Drivers	Evaluation Criteria	Weightages
1	Market Acceptability	Financial Viability and Fiscal Support	15%
2		Economic Feasibility	10%
3		Demand Growth/Traffic Volume/Capacity Ratio	10%
4		Environmental impacts and resettlements	5%
5	Manageable Life Cycle Costs	Facility availability and contracting of professional, managerial, and operational services appears to be manageable	15%
6	Risk Sharing	Establishment of appropriate contractual agreements to share risk between different parties.	15%
7	Institutional readiness of implementation agency	Existence of PPP unit and Project Management Unit	10%
8		Has implemented successful PPP projects or willingness to undergo trainings	10%
9		Willingness to obey best PPP Practices	10%

In Project Screening and Selection of priority PPP Projects guide by Philippines the following weightages suggested based on the project attributes (Preparatory Survey for Public-Private Partnership (PPP) Infrastructure). Table 2.6 illustrates criteria and weightages used in Philippines. A detail evaluation of weightage based on the project parameters are given in Appendix 2.

Table 2.6 Detail criteria and weightages used in Philippines

	Category	Criteria	Maximum weightage
1	Necessity and Urgency of the Project	Economic viability	15
2		Functional importance of the highway	6
3		Contribution to national/regional economic development	2
4		Contribution to national/regional social development	3
5		Contribution to traffic decongestion	6
6		Project readiness	8
7	Profitability	SPC's profitability	10
8		Equity investor's profitability	3
9		Relief of government's financial burden	10
10		Potential project cost risk (cost increase by 10%)	3
11		Potential project revenue risk (Revenue decrease by 10%)	4
12		ROW acquisition	10
13		Social impact	10
14		Natural environment	5
15		Construction difficulty	5

2.11 Public Private Partnership Evaluation on Highway Projects in Sri Lanka

2.11.1 Colombo Katunayake Expressway

For the first time, PPP option was considered for Colombo Katunakaye Expressway (CKE) Project in 1995. In the report by Asian Development Bank, the social benefits of the projects are mentioned for further analysis. Initial Poverty Analysis examines how the projects is used in poverty alleviation. As a highway project CKE can create economic growth with reduced travel time, cost, and improved efficiency. Also, it can create jobs, thus leads to social development. Further with the usage of private investment in the highway, government can directly use the funds to other projects to alleviate poverty.

In a research on failure of Private Finance Initiative (PFI) on CKE, root causes of failure and related risks have been discussed. The following reasons are mentioned in the research as root causes for failure (Yatanwala & Jayasena, 2008).

1. Inflationary economic environment in the country
2. Uncertainty of the forthcoming government support to PPP
3. Uncertainty of government policy changes
4. Public perception on user charging
5. Competition from A3 road on tolling
6. Inaccuracy of traffic forecasting
7. Inability of handling the toll revenue in the concession period by politicians
8. Terrorism risk in the country
9. Absence of duty waivers for concessionaires
10. Inability to long term plan the investment

When considering the risks Political risk, forecasting traffic and financial risks are mentioned.

2.11.2 Northern Expressway

In 2013, China Merchants Group carried out a PPP evaluation of Northern expressway Colombo to Meerigama (41.9 km) and Meerigama to Kurunagela (38.42 km). From the analysis FNPV of the 2 projects calculated as USD -739 million and FIRR as 0.8% (Northern Expressway Project Stages 1 & 2 (Colombo-Kurunagela Expressway), 2013).

For the project to be commercially viable the following proposals were submitted by China Merchants Group.

1. Extension of concession period up to 50 years
2. Permission to determine the toll rates by China Merchants Group
3. The group requested to operate stage 4 of Northern Expressway without any equity investment
4. Operating revenue of Colombo-Katunayake Expressway was requested by the group without any investment
5. Port city land requested for commercial purposes
6. Exemption of land lease fees, premiums, and land related taxes
7. Land acquisition and resettlement cost contributed by the government
8. Exemption of VAT for toll revenue, duty for capital goods and permission to import expressway operation and maintenance related vehicles

2.11.3 New Kelani Bridge (NKB) to Athurugiriya Elevated Highway

This project was identified from Ministry of Megapolis, National Master Plan. A cabinet decision was taken to undertake this project as PPP. This project was planned to be implemented in 2 phases, NKB to Rajagiriya and Rajagiriya to Athurugiriya. This project was considered to be optimal for PPP due to following reasons.

1. This project was in the project pipeline.
2. The project will provide high connectivity by connecting Port Elevated Highway and Outer Circular Highway.
3. The elevated road with less access feature enables to have toll road.

4. Operation and Maintenance not required for the project for first 5 years.
5. The second phase is expected to provide high connectivity; thus, the breakeven point of the project is expected to achieve near faster after second phase construction.

Concession period of 30 years was planned to adapt for this project. Nine (9) potential private partners were selected from twelve (12) after Expression of Interest (EOI) stage. The phase I of the project was prepared up to Request for Qualifications and Request for Proposals (RFP) stage. But in 2020, due to political changes the concessionaire selection process was terminated.

3.0 METHODOLOGY

3.1 Introduction

Research methodology covers the path to solve the research problems. In this research, selection criteria were identified from literature review from specific guidelines used by other countries. The criteria were further shortlisted using the questionnaire survey analysis. In the next step, the finalized criteria were compared with past, ongoing and future Sri Lankan projects.



3.2 Background Study about the Research and Clarifications

During the initial period of the project, a background study about the research was carried out. Details of PPP financing in other countries, PPP industries, PPP models and details of PPP in Sri Lanka were gathered.

3.3 Selection of Criteria

3.3.1 Multi-Attribute Analysis

Multi-attribute analysis was a method used to select a project based on a criteria package. There can be sub criterion packages under main packages. Weightages can be given to main criteria and sub criteria. There should be maximum attainable score to each criterion. Each project can be evaluated against the criteria and a total score can be calculated. This method is developed based on the similar research on PPP to Select concessionaire by Zhang (Zhang, Concessionaire Selection : Methods and Criteria, April 2004).

From the literature studies, criteria used by United States Department of Transportation, Public Private Infrastructure Advisory Facility, Transport Paper (TPI) by – World Bank, Project Preparation/Feasibility Guidelines by Pakistan, Screening

and Selection Guidelines in Philippines, Public Private Transportation Partnerships Implementation Manual & Guidelines by Commonwealth of Pennsylvania and PPP guidelines of Virginia Transportation were analyzed. Based on that, the following criteria in Table 3.1 were taken into consideration.

Table 3.1 Sub criteria packages based on guidelines followed in other countries

Public sector related factors	Project demand related factors	Financial related factors	Risk related factors	Project scale related factors
Fiscal support	Urgency of the project to reduce congestion	Financial viability	Cost minimization and value capture maximization in conceptual stage	Project cost
Governments policy to use private skills	National/ regional economic development from the project	User pricing	Environmental clearance and ROW acquisition from public sector	Project design and construction complex
Chance of continuing project regardless of the changes of government	Public support for PPP in the country	Long range revenue potential	Transfer of significant O&M risk to private team	Project functional scope

PPP successful in the country	Presence of projects in highway plans	Legal authority to use private capital	Design of the project to achieve best practice by PPP	Public agency capability
Availability of PPP framework	National/ regional social benefits	Impact of project on viability of existing toll roads	Public sponsor's aversion to risk	
	Network role importance		Cost and revenue risks	
	Safety needs		Land acquisition	
			Resettlements	
	Project meeting environment safeguards			

The key purpose of this study is to develop a number of criteria which can better represent the decision makers in project selection. The criteria used in the decision making should be measurable, relevant to project decision, able to distinguish alternatives and should represent all the stakeholders (Colorado Department of Transportation, 2020).

Further, project-based criteria is considered as most of the public sector related factors are common for all projects in Sri Lanka in selection of PPP. Since the PPP selection is done before the detailed feasibility studies, criteria should be represented by project indicators which can be collected in the initial stage of the projects.

3.3.1 Selection of Appropriate Criteria from each Sub-category

3.3.1.1 Demand related factors

Among the urgency of the project to reduce congestion, national and regional economic development from the project, public support for PPP in the country, presence of projects in highway plans, national and regional social benefits, network role importance and safety needs to be based on the importance of the project, measurable parameters will be selected to these criteria. Table 3.2 presents the demand criteria and indicators to represent them.

Table 3.2 Indicators to represent project demand subpackage Criteria

No	Criteria	Indicators
1	The urgency of the project to reduce congestion	Reduction of Travel Time in PCU -hour/day, Number of traffic attracted to a link
2	National, regional economic development	Economic Internal Rate of Return (EIRR) Economic Net Present Value (ENPV) Benefit-Cost Ratio (BCR)
3	Public support for PPP in the country	No direct measurable indicators
4	Presence of projects in highway plans	Presence of project in highway plans
5	National, regional social benefits	Net Present Social Value (NPSV)
6	Network role importance	The role of the project in networks, Connectivity to airport, port or railway
7	Safety needs	Expected accident reduction from the projects in numbers

3.3.1.2 Financial related factors

Financial viability is crucial in the selection of PPP Projects. The Bankability of the project depends on the financial factors. The following financial criteria are analyzed with the indicators. Table 3.3 presents the financial criteria and indicators to represent them.

Table 3.3 Criteria and Indicators for financial subpackage

No	Criteria	Indicators
1	Financial viability	Financial Internal Rate of Return (FIRR) Financial Net Present Value of the project (FNPV)
2	User pricing	Toll rates (Most case not readily available during project selection)
3	Long-range revenue potential	Revenue from the project during the operational period
4	Legal authority to use Private capital	The legal system of the country to allow PPP
5	Impact of project on the viability of existing toll roads	Loss or gain of toll revenue in monetary terms in other toll roads from the new project

3.3.1.3 Risk-related factors

As the risks arising from the project are crucial in the selection of PPP projects, the following criteria in Table 3.4 should be considered. Further, these criteria should be represented by an indicator during the selection progress.

Table 3.4 Criteria and indicators for risk related subpackage

No	Criteria	Indicators
1	Cost minimization and value capture maximization in conceptual stage	Public Sector Comparator Shadow Bid Model
2	Environmental clearance and ROW acquisition from Public sector	Relative easiness of the procedure to obtain clearances for the project – A qualitative opinion
3	Transfer of significant O&M risk to private team	Risk in monetary term transferred to private party from PPP arrangement
4	Design of the project to achieve best practice by PPP	The complexity of the project in terms of constructability
5	Public sponsor's aversion to risk	Policies, past experiences – A qualitative indicator
6	Cost and revenue risks	Chance of cost increase or decrease by percentage Chance of Revenue increase or decrease by percentage
7	Land acquisition	Percentage of the area expected to acquire for the project
8	Resettlements	Number of families need to be relocated

9	Project meeting environment safeguards	Environmental parameters required by compliance agencies
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3.2.1.4 Project scale related factors

The project scale can be considered as an important factor to decide whether a project is undertaken as a PPP or financial method. Table 3.5 summarize the criteria and relevant indicators to represent scale related factors.

Table 3.5 Criteria and indicators used in scale related subpackage

No	Criteria	Indicators
1	Project cost	Cost of the project
2	Project design and construction complex	Qualitative measures from experts regarding design and construction difficulties
3	Project functional scope	The km of the road section with number of lanes
4	Public agency capability	The fund allocation for the year The debt GDP ratio of the country

3.4 Questionnaire Survey

Questionnaire survey method was used to verify the criteria and its relevancy to Sri Lanka, shortlist crucial preliminary and secondary screening criteria and find out the score of the key criteria. These questions were designed in a way to achieve the above objectives. One of the major problems was that very limited number of participants were available to get these details. The steps involved in designing and analyzing a questionnaire are listed below.

1. Identification of the research questions
2. Preparation of questionnaire
3. Selection of sample
4. Pilot questionnaire
5. Data collection through the main questionnaire
6. Data analysis
7. Presentation of results

When preparing the questionnaire, the questions were simplified to help the respondents. A pilot questionnaire survey used to improve the final questionnaire to yield better and efficient results from respondents. Twenty (20) number of criteria were finalized in the questionnaire. These criteria are subdivided into, demand related, financial related risk related and scale related subpackages as mentioned in section 3.3.

As a first step of questionnaire survey, ranking was carried out for each subpackages. Respondents were asked to rank all criteria under the subpackage. For example, the respondents were requested to rank 1 to 5 for each criterion under demand subpackage. In order to find out the preferred criterion, Garrett's ranking technique was used (Dhanavandan , 2016). Using Garrett's ranking technique all the ranks were converted to score values. The following formula and Garrett's table were used to convert ranks into scores.

$$\text{Percent Position} = 100 (R_{ij}-0.5) / N_j$$

Where;

R_{ij} = Ranked given for i^{th} criterion by j^{th} respondent

N_j = Number of criteria ranked by j^{th} respondent

Thus, a most significant criterion to represent each subpackage can be selected.

In the next step, to identify the importance of each criterion, a 1-10 numerical rating scale is used. This 10-point scale used to indicate the following importance of the criteria in decision making. One (1) implies least significant for the decision making while Ten (10) implies most significant for the decision making.

3.5 Data Collection

Data were mainly collected from interviews with Project Directors and Engineers, Ministry of Finance Advisors, and Reports. The following data were collected on from projects.

1. Number of traffic attracted to the link (PCU/day)
2. Reduction of travel time (PCU-hour / day)
3. ENPV and EIRR of the project
4. FNPV and FIRR of the project
5. Estimated toll revenue during the planning stage and actual toll revenue
6. Initial project cost and maintenance cost required in the lifetime of the road
7. Actual cost incurred for the project and actual maintenance cost for a lifetime (for completed projects)
8. Land acquisition required for the project
9. Number of families need to be relocated and structures to be demolished
10. Trace passes an environmentally sensitive area
11. Environmental impacts of the project (Project Specific)
12. Construction difficulty (technical feasibility) of the projects
13. Overall economic, social, regional development after the road

3.6 Interview with Public Private Partnership Experts

Interviewing experienced and trained experts was one of the key methods used in this research. Nine (9) staff from National Agency for Public Private Partnerships, Sri Lanka and Road Development Authority, Sri Lanka were interviewed. Questions were prepared based on the need of the topic prior to the interview. Further discussion was carried out based on the opinion of experts spontaneously. Face to face interviews, telephone calls and emails were used to exchange the ideas. Based on their answers, criteria were shortlisted before the final preparation of the questionnaire.

3.7 Case Study

Ten (10) Sri Lankan expressway projects were selected. The feasibility study report of these projects were used to collect details about the projects. Further interviews with directors and project engineers were carried out.

4.0 IDENTIFYING PRELIMINARY AND SECONDARY SELECTION CRITERIA FROM QUESTIONNAIRE ANALYSIS

4.1 Introduction

The analysis of questionnaire survey and results are provided in this chapter. The preliminary and secondary criteria were selected based on the outcomes of the survey.

4.2 Data Analysis

A questionnaire survey was conducted among 9 respondents from RDA, NAPPP, and private consultants. Responses were collected from experts who are experienced in both highway and PPP projects.

Among the 9 participants, 7 people had more than 15 years of experiences in projects and 2 had 5-10 years of experience. The survey was conducted from April to June 2020. Respondents were contacted via mail, LinkedIn, and in-person meetings. The sample of the survey is given in Appendix 1.

The following five research questions are analyzed in this chapter.

1. What are the demand related criteria which can be used in PPP project selection from demand subpackage (Provide rank 1 for the most important criteria and rank 5 for the least important criteria)?
2. What are the financial related criteria which can be used in PPP project selection from financial subpackage (Provide rank 1 for the most important criteria and rank 4 for the least important criteria)?
3. What are the risk related criteria which can be used in PPP project selection from risk subpackage (Provide rank 1 for the most important criteria and rank 7 for the least important criteria)?
4. What are scale related criteria which can be used in PPP project selection from scale subpackage (Provide rank 1 for the most important criteria and rank 4 for the least important criteria)?
5. Rank 1 to 6 criteria selected by respondents with 1-10 rating scale.

4.2.1 Demand Criteria

Five (5) criteria were classified under demand classification. The purpose of the question is to select a criterion to better represent demand of the project. A Rank from 1 to 5 was assigned respectively for most important to least important criterion by respondents. The percentage of respondents for each criterion and rank summarized in Table 4.1.

Table 4.1 Percentage of responds for each rank and criterion

Demand criterion	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Urgency of the project to reduce congestion	67%	0%	0%	11%	22%
National, regional economic development	22%	44%	33%	0%	0%
Safety needs	11%	0%	11%	0%	78%
National, regional social benefits	0%	22%	33%	44%	0%
Role of the road in network development	0%	33%	22%	44%	0%

Figure 4.1 shows the percentage of ranks given by nine respondents for each criterion.

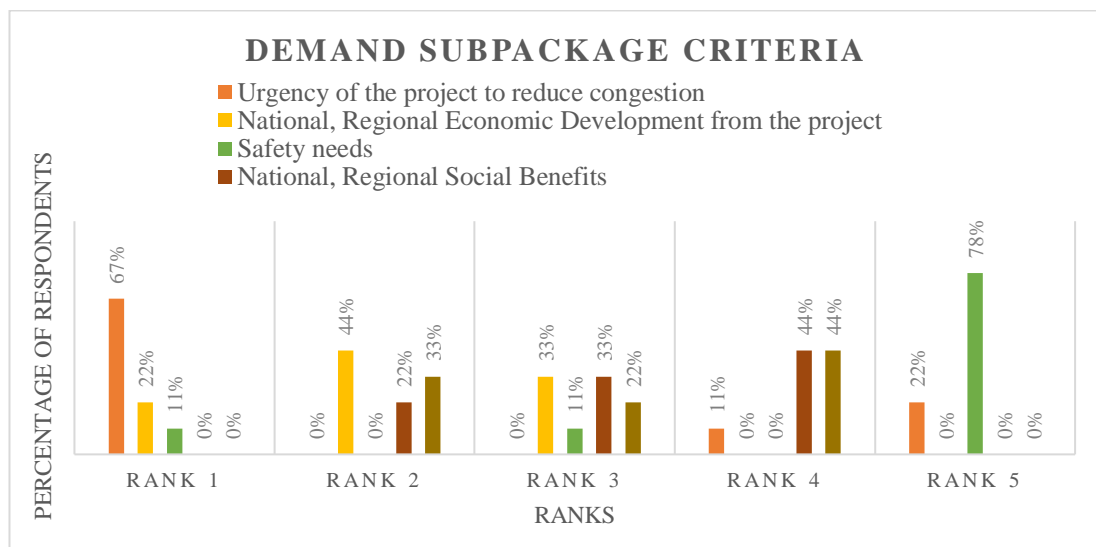


Figure 4.1 Demand criteria from questionnaire survey

From Figure 4.1, the urgency of the project to reduce the congestion was considered as rank 1 by 67% of the respondents. national, regional economic development was selected as rank 1 and rank 2 by 22% and 44% of respondents, respectively.

For further analyses, using Garrett’s ranking technique all the ranks were converted to score values as shown in Table 4.2. The Garrett formula and Garrett’s table were used to convert ranks into scores. From the formula, when there are five criteria, score of 75.1, 60.4, 50.0, 39.7 and 24.9 are given to Rank 1, Rank 2, Rank 3, Rank 4 and Rank 5 respectively. Total score was calculated for each criterion to identify the final ranks.

Table 4.2 Average score each demand related criterion

	Score by Garrett ranking formula and conversion table				
Respondents	Urgency of the project to reduce congestion	National, regional social benefits	National, regional economic development from the project	Role of the road in network development	Safety needs
Respondent -1	75.1	60.4	50.0	39.7	24.9
Respondent -2	75.1	39.7	60.4	50.0	24.9
Respondent -3	24.9	39.7	75.1	60.4	50.0
Respondent -4	39.7	50.0	75.1	60.4	24.9
Respondent -5	75.1	39.7	50.0	60.4	24.9
Respondent -6	75.1	50.0	60.4	39.7	24.9
Respondent -7	24.9	50.0	60.4	39.7	75.1
Respondent -8	75.1	39.7	60.4	50.0	24.9
Respondent -9	75.1	60.4	50.0	39.7	24.9
Average Score	60.0	47.7	60.2	48.9	33.3

From Table 4.2 urgency of the project to reduce congestion and national, regional, economic development from the project can be selected as most important criteria to represent demand related sub package.

4.2.2 Financial Criteria

Four (4) criteria were included under financial classification. The percentage of respondents ranked each criterion are presented in Table 4.3. Figure 4.2 depicts the results in a bar chart.

Table 4.3 Percentage of respondents for each rank and criterion for financial subpackage

Financial criterion	Rank 1	Rank 2	Rank 3	Rank 4
Financial viability	67%	33%	0%	0%
Long range revenue potential from the project	22%	56%	0%	22%
Impact of project on viability of existing toll roads	11%	11%	22%	56%
User pricing (Toll rates)	0%	0%	78%	22%

From Table 4.3, 67% of the respondents ranked the financial viability as rank 1 and 33% of the respondents ranked it as rank 2.

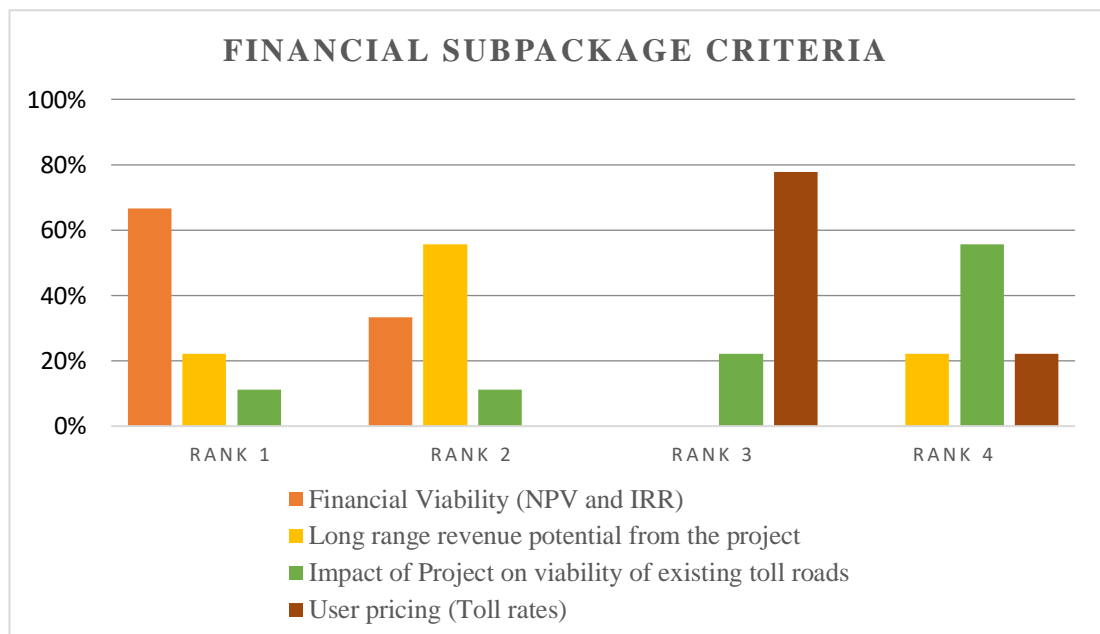


Figure 4.2 Financial criteria from the questionnaire survey analysis

Garrett scoring technique was used to convert the rankings of financial criteria into score as in Table 4.4 below.

Table 4.4 Criterion score using Garrett's technique

Score by Garrett ranking formula and conversion table				
Respondents	Financial Viability	Long range revenue potential from the project	User pricing (Toll rates)	Impact of Project on viability of existing toll roads
Respondent -1	72.6	56.3	43.7	27.4
Respondent -2	72.6	56.3	27.4	43.7
Respondent -3	72.6	56.3	43.7	27.4
Respondent -4	72.6	27.4	43.7	56.3
Respondent -5	56.3	72.6	43.7	27.4
Respondent -6	72.6	56.3	43.7	27.4
Respondent -7	56.3	27.4	43.7	72.6
Respondent -8	56.3	72.6	27.4	43.7
Respondent -9	72.6	56.3	43.7	27.4
Average score	67.2	53.5	40.1	39.3

From Table 4.4, financial viability received the highest average score. Thus, financial viability criteria can be identified as most preferred criterion to represent financial related subpackage.

4.2.3 Risk Criteria

Seven (7) criteria were considered under risk category. The percentage of respondents for each rank and criterion is given in Table 4.5.

Table 4.5 Percentage of respondents for each rank and criterion for risk related sub package

Risk Criterion	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 7
Value for Money from the project	67%	11%	0%	0%	11%	11%	0%
Transfer of significant Operational & Management risk to private team	11%	33%	0%	22%	22%	0%	11%
Design of the project to achieve best practice by PPP	11%	11%	33%	0%	44%	0%	0%
Cost and revenue Risks	11%	11%	11%	22%	0%	22%	22%
Land acquisition	0%	22%	33%	11%	0%	0%	33%
Resettlements	0%	11%	11%	33%	0%	33%	11%
Project meeting environment safeguards	0%	0%	11%	11%	22%	33%	22%

Figure 4.3 is used to represent the risk related subpackage criterion percentage of respondents assigned for each rank. From Figure 4.3, 67% respondents were ranked VfM analysis as rank 1.

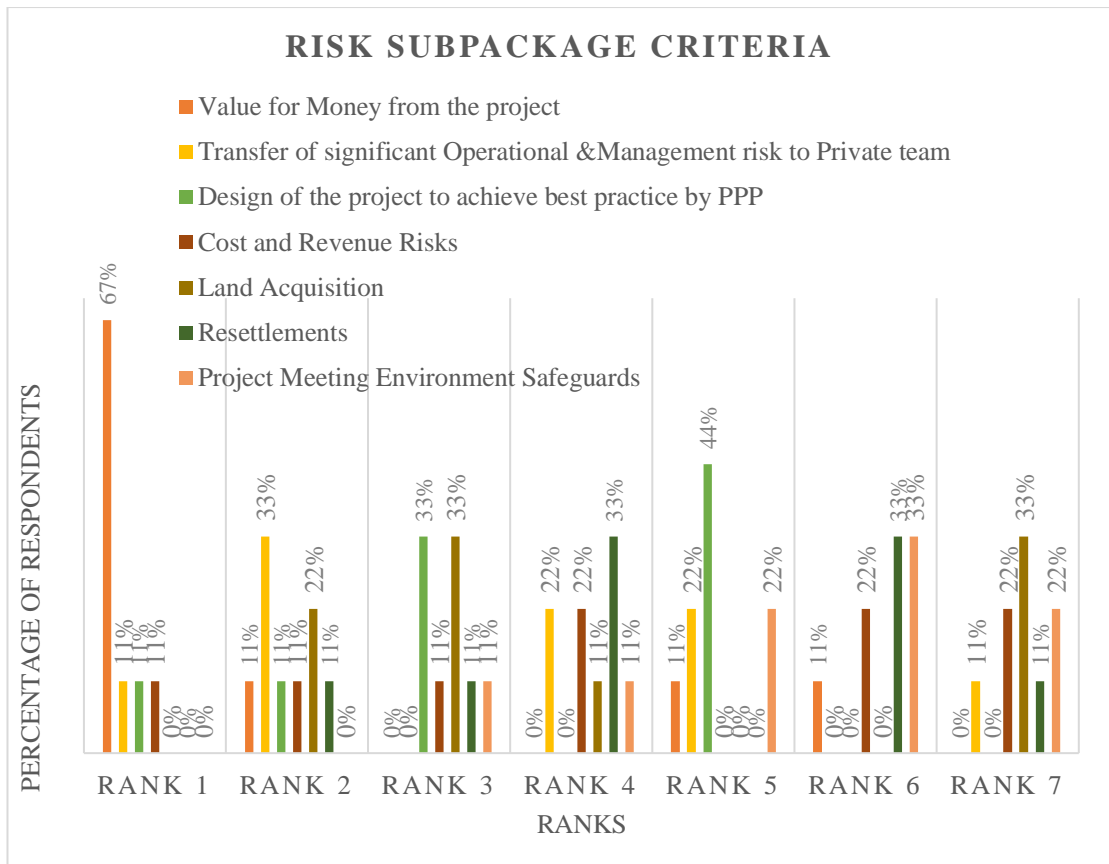


Figure 4.3 Risk criteria from questionnaire survey analysis

Garrett scoring technique was used to convert the rankings of risk criteria into score as in Table 4.6 below.

Table 4.6 Garrett technique used for risk related subpackage

	Score by Garrett ranking formula and conversion table						
Respondents	VfM	O&M risk	Design	C&R risk:	Land acquisition	Resettl ements	Enviro nment
Respondent -1	78.6	42.8	57.2	50.0	65.6	21.5	34.4
Respondent -2	78.6	65.6	42.8	21.5	57.2	50.0	34.4
Respondent -3	65.6	78.6	42.8	34.4	57.2	50.0	21.5
Respondent -4	78.6	50.0	42.8	21.5	65.6	57.2	34.4
Respondent -5	78.6	65.6	57.2	50.0	21.5	34.4	42.8
Respondent -6	34.4	42.8	78.6	65.6	57.2	50.0	21.5
Respondent -7	78.6	21.5	42.8	34.4	50.0	65.6	57.2
Respondent -8	42.8	65.6	57.2	78.6	21.5	34.4	50.0
Respondent -9	78.6	50.0	65.6	57.2	21.5	34.4	42.8
Average Score	68.2	53.6	54.1	45.9	46.4	44.2	37.7
<p>VfM: Value for Money from the project</p> <p>O&M risk: Transfer of significant Operational & Management risk to Private team</p> <p>Design: Design of the project to achieve best practice by PPP</p> <p>C&R risk: Cost and Revenue risks</p> <p>Environment: Project meeting environment safeguards</p>							

From Table 4.6, VfM from the project was identified as most significant criterion under risk related subpackage. As given under section 2.6.2, VfM can be calculated conducting a risk assessment, public sector comparator and using shadow bid model.

4.2.4 Scale Criteria

Four (4) criteria were included in scale related subpackage. The percentage of respondents for each rank and criterion are given in Table 4.7.

Table 4.7 Percentage of respondents for each rank and criterion

Scale Criterion	Rank 1	Rank 2	Rank 3	Rank 4
Project Cost	44%	11%	44%	0%
Project Functional Scope	22%	11%	33%	33%
Public Agency Capability in funding the project	22%	11%	11%	56%
Project Design and Construction complex	11%	67%	11%	11%

The bar chart in Figure 4.4 used to graphically represent the percentage of respondents for ranks and criterion.

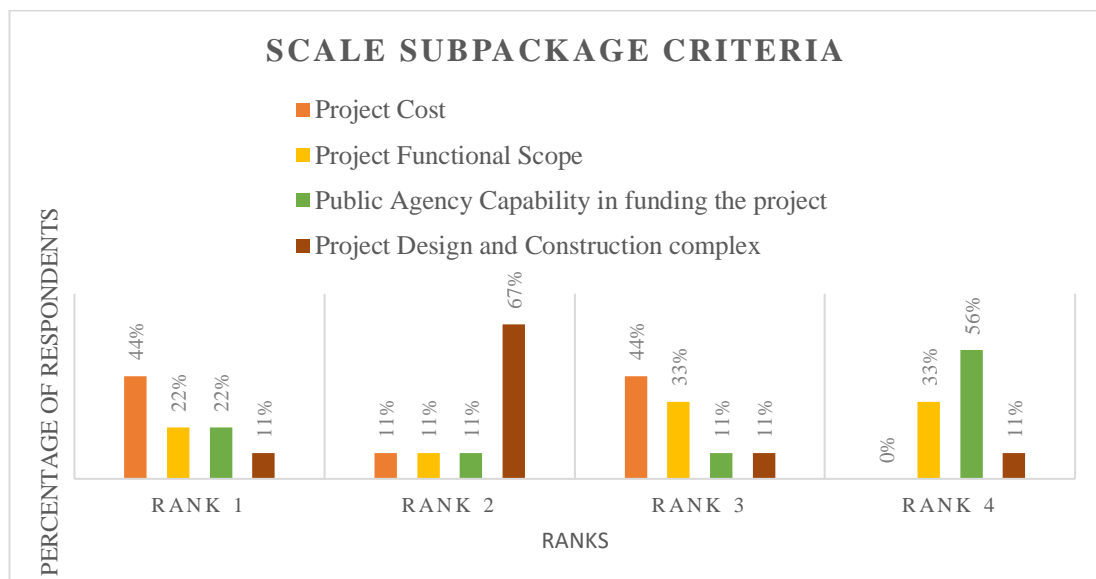


Figure 4.4 Scale criteria from the questionnaire survey analysis

From Figure 4.4, the project cost was ranked 1 by 44% of respondents. Table 4.8 used to present the average score for each criterion using Garrett technique.

Table 4.8 Garrett technique used for scale related subpackage

Respondents	Score by Garrett ranking formula and conversion table			
	Project Costs	Project Design and Construction complex	Project Functional Scope	Public Agency Capability in funding the project
Respondent -1	72.6	56.3	43.7	27.4
Respondent - 2	43.7	56.3	72.6	27.4
Respondent -3	43.7	27.4	72.6	56.3
Respondent -4	72.6	56.3	27.4	43.7
Respondent -5	72.6	56.3	43.7	27.4
Respondent -6	43.7	56.3	27.4	72.6
Respondent -7	72.6	56.3	43.7	27.4
Respondent -8	56.3	43.7	27.4	72.6
Respondent -9	43.7	72.6	56.3	27.4
Average Score	57.9	53.5	46.1	42.5

Project costs value was selected as the most important criterion by 4 respondents. Based on the scores given on Table 4.8, the project cost is scored slightly higher than project design and construction complex. Also, project costs can be quantitatively analyzed. In Sri Lanka, USD 50 million is considered as the minimum value for PPP projects due to the preparation works involved in the PPP projects.

4.2.5 Ranking and Rating of Six Preferred Criteria for Selection of Project

All the respondents were requested to select most important criteria from the twenty criteria and their suggestions if any. Further respondents were requested to provide a 1-10 score for first six criteria they preferred. Purpose of the section is to shortlist most important criteria for secondary screening. Table 4.9 provides percentage of rank 1 – 6 given by respondents for their preferred criteria.

Table 4.9 Percentage of top six ranks given by respondents for each criterion

No.	Criteria	Percentage of ranks given by respondents for each criterion (%)					
		Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6
1	Financial viability	44.4	11.1	11.1		11.1	11.1
2	Value for Money from the project	33.3			22.2	11.1	
3	Long range revenue potential from the project	11.1	11.1		11.1	22.2	
4	Transfer of significant Operational & Management risk to private team	11.1	11.1		11.1		22.2
5	National, regional, economic development		22.2	22.2		11.1	
6	Urgency of the project to reduce congestion		22.2		11.1	11.1	
7	Design of the project to achieve best practice by PPP		11.1	11.1			11.1
8	Cost and revenue risks		11.1	11.1			
9	Role of the road in network development				22.2		
10	Project cost			11.1			11.1
11	Public agency capability in funding the project				11.1		11.1
12	Project design and construction complex					11.1	11.1
13	National, regional social benefits			11.1			
14	Impact of project on viability of existing toll roads			11.1			
15	Project functional scope					11.1	

16	Resettlements				11.1		
17	Project meeting environment safeguards					11.1	
18	Safety needs						11.1
19	Land acquisition						11.1

Figure 4.5 summarize the ranks given by respondents in chart format.

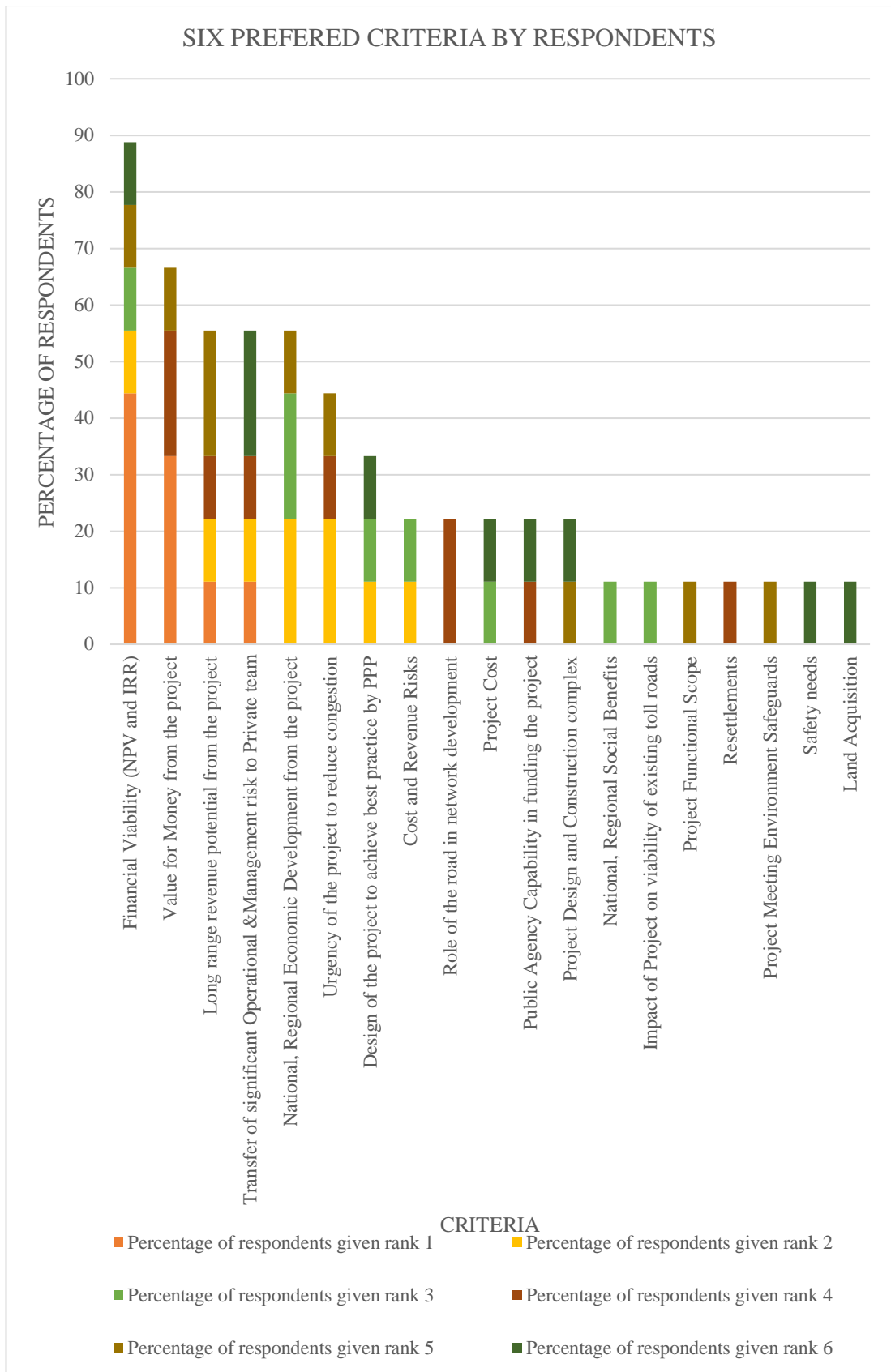


Figure 4.5 Percentage of ranks given for criteria by respondents

From Figure 4.5, 88% of the respondents selected Financial viability as top 6 criteria to be considered in decision making. Further, VfM from the project (66.6%), long range revenue potential (55.5%), transfer of significant operational & management risk to Private team (55.5%), national, regional economic development from the project (55.5%), Urgency of the project to reduce congestion (44.4%) and Design of the project to achieve best practice by PPP (33.3%) were selected by more than 30% of the respondents.

User pricing (toll rates) was not selected by any respondents among the first-six preferred criteria. From the expert interview, the reason for exclusion of user pricing is that it can be controlled. So, it is not required to consider it as a key criterion in decision making. In addition, bankability of the project was added as a key criterion by a respondent with the rating of 10.

Based on the rating given by respondents, total score was calculated for each criterion. Maximum achievable score is 90. Since only top six criteria were asked to provide a rating, calculation of mean, standard deviation is not comparable. So, these are not calculated in this section.

For comparison purpose of each criterion score, the percentage of the total score for the criteria divided the summation of score for all criteria was calculated in Table 4.10. Aggregated score given by respondents for all criteria is 427.

Table 4.10 Total rating given for criteria by respondents

	Criteria	Total score of the criteria	% of Total score for the criteria/ Aggregated total score for all criteria
1	Financial viability (FNPV and FIRR)	71	17%
2	Value for Money from the project	52	12%
3	Long range revenue potential from the project	42	10%
4	Transfer of significant Operational & Management risk to private team	42	10%
5	National, regional economic development from the project	40	9%
6	Urgency of the project to reduce congestion	34	8%
7	Design of the project to achieve best practice by PPP	22	5%
8	Cost and revenue risks	18	4%
9	Role of the road in network development	15	4%
10	Project cost	15	4%
11	Public agency capability in funding the project	14	3%
12	Project design and construction complex	14	3%
13	National, regional social benefits	9	2%
14	Impact of project on viability of existing toll roads	8	2%
15	Project functional scope	7	2%

16	Resettlements	6	1%
17	Project meeting environment safeguards	6	1%
18	Safety needs	6	1%
19	Land acquisition	6	1%
		427	100%

Highest total score was given to financial viability criteria. This was considered as the most important criteria in other guidelines as well, as mentioned in section 2.9 in selection of highway PPP projects.

4.3 Preliminary and Secondary Screening Criteria Selection

4.3.1 Preliminary Screening Criteria

From the data analysis in given in section 4.2, the following criteria can be selected as better criteria to represent each subpackage.

1. Demand subpackage - Urgency of the project to reduce congestion and national, regional economic development from the project
2. Financial subpackage - Financial viability (FNPV and FIRR)
3. Risk subpackage - Value for Money from the project
4. Scale subpackage - Project cost

All except VfM from the project, can be indicated by quantitate indicators easily. From Garrett ranking technique score calculated in section 4.2.3 for risk subpackage items, VfM from the project, transfer of significant Operational and Management risk to private team, design of the project to achieve best practice by PPP, and land acquisition scored 68.2, 53.6, 54.1, 46.4, respectively. Land acquisition can be quantitatively indicated by the percentage of the area expected to acquire for the project. So, for risk subpackage, land acquisition can be taken to represent risk qualitatively.

As mentioned in section 3.3.1 indicators can be used to represent criteria. The indicators used to represent the shortlisted preliminary screening criteria.

Criteria shortlisted for preliminary screening with suggested indicators

1. Urgency of the project to reduce congestion (PCU/day) and National, regional economic development from the project (EIRR)
2. Financial viability (FIRR or FNPV)
3. Land acquisition (Percentage of the area expected to acquire for the project)
4. Project cost (Project Cost Value)

4.3.2 Secondary Screening Criteria

From section 4.1.5, key criteria selected for the decision making. Based on the section 4.1.5 findings, literature review in 2.10 the following criteria in Table 4.11 are evaluated for the secondary screening.

Table 4.11 Criteria evaluation for secondary screening

	Criteria	Subcriteria package	Reason for selection of criteria	Selected or not for secondary screening
1	Financial viability	Financial	Most preferred criteria from 4.15, included in Public Private Infrastructure Advisory Faculty and Philippines guidelines in section 2.10.	Selected for secondary screening. Maximum score of 17 suggested.
2	Value for Money from the project	Risk	Selected by 66.6% respondents as a key criterion for decision making.	Due to its data requirement, it is advised to analyze in final screening.
3	Long range revenue	Financial	Selected by 55.5% respondents as a key	Selected. Maximum score of 10 suggested.

	potential from the project		<p>criteria for decision making.</p> <p>Revenue potential is looked by banks and private partners for funding.</p>	
4	Transfer of significant O&M risk to private team	Risk	This a key feature of PPP. For a successful PPP risk transfer is mandatory.	Selected. Maximum score of 10 suggested.
5	National, regional economic development from the project	Demand	This is included in all the guidelines mentioned in section 2.5.	Selected. Maximum score of 9 suggested.
6	Urgency of the project to reduce congestion	Demand	Included in Philippines selection guideline and Public Private Infrastructure Advisory Faculty toolkit.	Selected. Maximum score of 8 suggested.
7	Design of the project to achieve best practice by PPP	Risk	<p>Selected by 33.35 percentage of respondents as a key criterion.</p> <p>Include under U.S Guidebook.</p>	Selected. Maximum score of 5 suggested.

8	Cost and revenue risks	Risk	Included in Philippines guide for PPP selection. Cost and revenue risk are significant failure factors in PPP projects as mentioned in 2.8.	Selected. Maximum score of 4 suggested.
9	Role of the road in network development	Demand	Included in Philippines guide for PPP selection.	Selected. Maximum score of 4 suggested.
10	Project cost	Scale	A criterion to represent project scale.	Selected. Maximum score of 4 suggested.
11	Public agency capability in funding the project	Scale	Included by 22.22% of the respondents as a key criterion.	Not selected.
12	Project design and construction complex	Scale	Included by 22.22% of the respondents as a key criterion.	Not selected.
13	National, regional social benefits		11.1% of the percentage of respondent listed as a key criterion.	Not selected.
14	Impact of Project on viability of	Financial	11.1% of the percentage of	Not selected.

	existing toll roads		respondent listed as a key criterion.	
15	Project functional scope	Scale	11.1% of the percentage of respondent listed as a key criterion.	Not selected.
16	Resettlements	Risk	11.1% of the percentage of respondent listed as a key criterion.	Not selected.
17	Project meeting environment safeguards	Risk	11.1% of the percentage of respondent listed as a key criterion.	Not selected.
18	Safety needs	Demand	11.1% of the percentage of respondent listed as a key criterion.	Not selected.
19	Land acquisition	Risk	11.1% of the percentage of respondent listed as a key criterion. During interview, it was stated that land acquisition is not a key issue in Sri Lanka.	Not selected.

20	User charges	Financial	Not included by any respondents as a key criterion.	Not selected.
21	Bankability of the project		Included by a respondent in suggestion and recommended as a key criterion. Not included in any criteria mentioned in section 2.5.	Can be included in the final screening.

From the evaluation in Table 4.11, the following nine (9) criteria considered for secondary screening.

1. Financial viability - Maximum recommended score is 17
2. Long range revenue potential from the project – Maximum recommended score is 10
3. Transfer of significant Operational & Management risk to private team - Maximum score recommended is 10
4. National, regional economic development from the project - Maximum score recommended is 9
5. Urgency of the project to reduce congestion - Maximum score recommended is 8
6. Design of the project to achieve best practice by PPP - Maximum score recommended is 5
7. Cost and revenue risks - Maximum score recommended is 4
8. Role of the road in network development - Maximum score recommended is 4
9. Project cost - Maximum score recommended is 4

4.4 Applicability of Screening Criteria

In this study based on the questionnaire survey results, preliminary and secondary screening criteria identified. But no threshold values were identified in this study. It is recommended to follow similar procedure to find preliminary and secondary criteria for any authority to develop screening criteria for highway PPP projects.

Appropriate threshold value for the indicators can be identified by the relevant authorities. For example, relevant authority could set an accepted value of FIRR for financial viability. Similarly, the relevant authorities could set a value for other indicators such as minimum PCU/day, EIRR, land acquisition requirement and minimum project cost.

5.0 COMPARISON ON ECONOMIC EVALUATION OF THE PROJECTS

5.1 Introduction

A case study was performed to compare the viability of existing expressway projects in Sri Lanka. The results are provided in this chapter.

As mentioned in section 3.7, ten (10) segments of expressway projects were selected, and the candidate nature of the projects were examined using criteria given in section 4.3.

In this study, for the comparison of projects only the criteria identified for secondary screening were used. Due to non-availability of qualifier threshold value for preliminary screening criteria, no projects screened out using the preliminary screening.

5.2 Summary Details of Expressway projects

5.2.1 Colombo – Katunayake Expressway

This was the first PPP project to be initiated and construction works were carried out between October 2000 to January 2003 with an initial cost of estimation of Rs. 9,516 million. With a 35% of physical progress and 57% of financial progress, the project was halted. Again, after renegotiations, in 2008 construction works were commenced with an estimated cost of Rs. 34,722 million. However, the cost increased to Rs. 40,619 million eventually due to change in scope of works.

The following Table 5.1 articulate the summary of data collected for the project. Data collected from Feasibility Report on Colombo – Katunayake Expressway by RDA, Annual Report of 2018 of RDA, a report by China Merchants Group on Traffic, Revenue, Operational and Maintenance cost estimation used to derive these data.

Table 5.1 Project details of Colombo Katunayake Expressway

Planned Amount	Actual Amount	Increase or Decrease
Initial cost estimation in 2008 – Rs. 34,722 million (Colombo Katunayake Expressway Project Audit Report, 2014)	Actual cost incurred - Rs. 40,619 million (Colombo Katunayake Expressway Project Audit Report, 2014)	16.98% of cost increase
Traffic number estimation- 52,636 vehicles per day by 2012 (Economic Feasibility of Colombo – Katunayake Expressway, 2008)	Actual Traffic Numbers in 2016 – 24000 vehicles per day	52% of Traffic numbers decrease
EIRR estimated 14.1 % (Economic Feasibility of Colombo – Katunayake Expressway, 2008)	Actual EIRR after adjusting for actual cost of construction and revenue – 10.0% (Kumarage, 2016)	4.1 % of EIRR was overestimated

One of the key criteria for PPP project selection is long term revenue potential. With overestimate of traffic volume, the revenue is estimated as a high value. Uncertainty in traffic estimation is one of the key reasons for PPP highway project failures as mentioned in section 2.8.

FIRR calculated in 1991 by Japan Bridge & Structure Institute, Inc. was 0.507% (Review study of the previous feasibility Study for Colombo Katunayake Project, 1991).

One of the key issues of this project was high estimation of traffic during the feasibility study.

5.2.2 Southern Expressway

The objective of the project is to reduce the traffic between Colombo to Matara with improved traffic safety and economic development in the Southern part of the country. The entire road is 130 km section from Kottawa to Godagama. Project details of Southern Expressway are given in Table 5.2.

Table 5.2 Project details of Southern Expressway

Planned Amount	Actual Amount	Increase or Decrease
Planned project cost 51,344 million yen	Actual project cost 63,460 million yen	24% increase than planned cost
EIRR was 13.3% in 2008 second phase analysis. (EIRR calculated in 1997 feasibility report was around 19%-25%)	EIRR recalculated after the completion by ADB was 16.9% (Miyazaki, 2015)	EIRR increased by 3.6%
FIRR calculated was 1% from 2003 to 2042 (Sri Lanka: Southern Transport Development Project - Completion Report, 2014)	Not available	

The project cost increased due to unforeseen civil works. In addition, taxes, land acquisition and resettlement additional cost increased the overall cost of the project. Despite of the cost increase, EIRR of the project increased after the completion while achieving economic and social benefits.

The GDP of the Southern Region increased by 15.7% from 2011 to 2014 (GDP from 718,768 million to 1112 Billion) compared to Western Province where the GDP was estimated to be 14.3% (Miyazaki, 2015).

For this project, around 5,683 families and 20,340 people were relocated (The Asian Development Bank’s Support for the Transport Sector in Sri Lanka, 2012).

5.2.3 Southern Extension Expressway.

This 74 km expressway section from Matara to Hambanthoda was estimated as 33.2 billion (US\$ 300 million) in 2007. EIRR of 6.2% was calculated for the Southern Extension Expressway (Economic Feasibility Study for Proposed ESH, 2007). But finally, a section of 96 km was agreed to build with a cost of Rs 224 billion (US\$ 1892 million). Estimated traffic for 2036 is 72655 PCU/day. FNPV value of the project was – US\$ 1271 Million at 2% discount rate (Feasibility Study for Section from Matara to Hambantota, 2013). Project details of Southern Extension Expressway are given in Table 5.3.

Table 5.3 Project Details of Southern Extension Expressway

Planned Amount	Actual Amount	Increase or Decrease
Initial cost US\$ 4 million per km	Actual cost of construction US\$ 20 million per km	400% increase of cost of construction from feasibility studies

One of the key issues for this project is, anticipated industries were not developed in the southern part.

5.2.4 Outer Circular Highway

The purpose of the project is to connect the Southern Expressway and other national roads radiating the Colombo city and to enhance the regional economy with improved connectivity.

This project has 3 section, 1. Kottawa and Kaduwela (11 km), 2. Kaduwela and Kadawatha (9km) and 3. Kadawatha to Kerawelapitiya (9km).

From the feasibility report by Orient Consultancy, the EIRR of the entire project was estimated as 18.87% in 2005. But it was revised on the report issued in 2008 by the same consultancy firm, the EIRR was 14.00% after the increased cost.

Cost of section 1 between Kottawa and Kaduwela, section 2 between Kaduwela and Kadawatha and section 3 between Kadawatha to Kerawalapitiya during the feasibility studies and contract cost are summarized in the following Table 5.4.

Table 5.4 Project details of Outer Circular Expressway - Three Phases

	OCH section 1	OCH section 2	OCH section 3
Link	Kottawa to Kaduwela	Kaduwela to Kadawatha	Kadawatha to Kerawalapitiya
Length	11km	9 km	9 km
Cost estimated by Orients consultants during feasibility studies	US\$ 120 million	US\$ 80 million	US\$ 50 million
Cost of the Project	US\$ 212 million (US\$ 19 million per km) in 2009	US\$ 329 million (US\$ 43 million per km) in 2012	US \$ 535 million (US\$ 59 million per km) in 2013
Actual Cost of the Project	Not Collected	44.88 billion Rupees	78 billion Rupees
BCR Estimated	2.17	3.23	1.93
Benefits - Cost	4, 767 million	13,869 million for section 1 and 2	8,826 million for section 1, 2 and 3

The actual traffic was 50% lesser than that estimated in 2016. During the feasibility study, the traffic estimated in 2020 was 55,000 PCU/ day (JICA, 2005). From the Feasibility study on OCH section 3, traffic of 1022139 PCU/ day on OCH section 1, 61502 PCU/ day on OCH section 2 and 73358 PCU/day on OCH section 3 were forecasted in 2037 (Feasibility Study on Construction of Outer Circular Highway Northern Section 2 from Kerawalapitiya to Kadawatha, 2013). The FNPV of OCH section 3 is reported as USD -315 Million at 2% discount rate.

5.2.5 Ruwanpura Expressway

From the feasibility study report of Ruwanpura Expressway (2015), the EIRR of the project is estimated as 11.8%. The cost of the construction cost estimated as USD 213 million in 2015. The FNPV of the project is - 199,339 million LKR (Feasibility Study of Ruwanpura Expressway, 2018).

The traffic by 2035 in both directions was estimated as 45000 PCU/day. For the 74 km road section, 100 acres of land acquisition was estimated.

5.2.6 New Kalani Bridge to Rajagiriya - Phase I

The objective of the project is to provide easy access to Outer Circular Highway and the rest of the expressway network. With the completion of Port Access Elevated Highway, the Colombo Port and the Port City will also be connected to the expressway network.

Administrative (Battaramulla), educational (Malabe) and Commercial (Port city) hubs will be created for this Elevated road. Easy access to the Administrative Capital, Battaramulla from Colombo Metropolitan area, Airport, and harbor connectivity via Port access elevated road will bring economic development.

Cost of the first phase is USD \$ 257.1 Million (LKR 133.9 Billion). EIRR of the project is estimated as 12.09% by PWC consultants. FIRR of the project is 4.39% (Feasibility Study and Preliminary Engineering Design of Elevated Highway Link Connecting Proposed Second New Kelani Bridge Project and Battaramulla Elevated Highway, 2015).

Number of traffic attracted if phase Rajagiriya to Athurugiriya is also constructed will be 39573 and 61118 PCU/day in 2035 based on CKE and SE toll rates respectively (Traffic Study Report, 2017).

For phase 1 of NKB- Athurugiriya, 30% of the land need to be acquired (70% land belongs to government). Resettlements from the project is 1100 families.

5.2.7 New Kalani Bridge to Athurugiriya - Phase II

The EIRR values for the project was 10.59% by PWC consultants. In 2015, feasibility study was conducted by Katahira & Engineers International for Battaramulla North Expressway Project. Here, the EIRR value and Benefit Cost Ratio for the total section was estimated as 19.1% and 1.88, respectively. In the study, FIRR for 30 years was estimated as 4.39% with a positive FNPV of 4,417.7 Million (3.69% discount rate).

The cost of the construction is estimated as USD 743.8 Million. The traffic numbers estimated as 42515 PCU/ day and 63972 PCU/day with CKE and SE rates, respectively.

5.2.8 Port Access Elevated Project

Objective of the project is to construct a link which provide direct access connect to Katunayake airport and port via New Kelani Bridge at Ingurukade, able to connect NKB- Athurugiriya Expressway. The total length of the section is 5.27 km.

This project is expected to reduce travel time and congestion by bypassing at grade local traffic. Traffic attraction in 2020 and 2040 will be 30,000 and 116,000 PCU/day, respectively.

Construction cost of the project including the toll structures is USD 360 Million. EIRR of the project is 11.63%, whereas the BCR is 2.31.

FIRR and FNPV of the project are 8.42% and Rs. 52,640 Million (at discount rate of 2.31%) respectively (Port Access Elevated Highway Project - Transport Project Preparatory Facility, 2017). The breakeven point of the project is expected to achieve in 2038. The user fee for the toll was calculated for the project based on the Willingness to Pay survey.

Land required for the project belongs to Port Authority, thus zero acquisition and relocation of households is required for this project.

5.2.9 Central Express Project -1 Kadwatha Mirigama Phase

The cost of the 37.1 km section was estimated as USD 916 Million (Economic Feasibility Analysis for Central Expressway Project, 2016). The FNPV of the project is calculated as negative USD 822.14 Million (Feasibility Study of Central

Expressway Section 1 from Kadawatha to Mirigama, 2016). The EIRR of the project was estimated as 14.91% by University of Moratuwa (Economic Feasibility Analysis for Central Expressway Project, 2016) and 12.09% by Road Development Authority. Lots of land required for this section is 4165.

5.2.10 Central Express Project -2 Mirigama Kurunagale Phase

39.29 km length section was estimated at USD 600 million cost. EIRR of the section was 12.36% and BCR was 2.53 (Economic Feasibility Analysis for Central Expressway Project, 2016).

FIRR was calculated as 0.81% by China Merchant Group in the financial proposal for Northern Expressway project stage1 and 2 (Liang, 2013). Lots of land acquisition incurred for this project is 3930.

5.3 Comparison of Projects for PPP Viability

In this case study, the preliminary criteria were not used to screen out projects, due to the absence of threshold value for indicators. But for better study, it is suggested to use preliminary screening criteria with threshold values for indicators, to short list projects.

5.3.1 Scoring criteria

Based on the expert judgment from interview, rating scales from respondents in the questionnaire survey, similar scores and weightages used by in other guidelines as in section 2.10 and appendix 2, scoring criteria and maximum score developed in this section. Due to non-availability of data some criteria recommended in 4.3.2 are excluded in Table 5.5.

Table 5.5 Scoring criteria

	Project	Indicator	Scoring Criteria and Score	Maximum Score
1	Financial viability	FIRR	<p>Very High: FIRR >15% = 17</p> <p>High: 10% < FIRR <15% = 12</p> <p>Medium: 5% < FIRR <10% = 8</p> <p>Low: 0% < FIRR <5% = 4</p> <p>Negative: FIRR <0% = 0</p>	17
2	National, regional economic development from the project	EIRR	<p>Very High: EIRR > 25% = 15</p> <p>High: 15% < EIRR < 25% = 10</p> <p>Medium: 12% < EIRR <15% = 7</p> <p>Low: EIRR <12% = 4</p>	15
3	Urgency of the project to reduce congestion	Traffic number expected after 20 years of project opening	<p>Number of traffic attracted to a link (PCU/day)</p> <p>High: Over 60,000 = 10</p> <p>Medium: 20,000 – 60,000 = 7</p> <p>Low: Less than 20,000 = 4</p>	10
4	Role of the road in network development	Functional importance of the link	<p>Very high: If the link form national integration or directly connects airport, railway hub or port =10</p> <p>High: If link provides flexibility in route selection or indirectly connects airport, railway hub or port =7</p>	10

			<p>Medium: Link connect to a brand of backbone transportation link = 4</p> <p>Low: Individual link =2</p>	
5	Project cost	Project cost	<p>High: Over USD 200 million = 10</p> <p>Medium: USD 100 million to USD 200 million = 7</p> <p>Low: Less than USD 100 million = 3</p>	10

Maximum achievable score is 62 from the above selection criteria.

5.3.2 Project details for scoring

The project details given in section 5.2 are summarized in the Table 5.6. The following abbreviations are used in Table 5.6 and 5.7.

CKE- Colombo - Katunayake Expressway

PAEP- Port Access Elevated Project

NKB Phase 1- NKB – Rajagiriya Elevated Project

NKB Phase 2- NKB – Athurugiriya Elevated Project

SE - Southern Expressway

CE (M-K) -Central Expressway- Mirigama to Kurunagela Section

RE - Ruwanpura Expressway

OCH 3- Outer Circular Highway Section 3

CE (M-K)- Central Express - Kadawatha to Mirigama Section

SEE - Southern Extension Expressway

ETA20 - Traffic number expected after 20 years of project opening

Table 5.6 Project details

	Project	Indicator	CKE	PAEP	NKB Phase 2	SE	CE (M-K)	NKB Phase 1	RE	OCH 3	CE (K- M)-	SEE
1	Financial viability	FIRR	0.51%	8.42%	4.59%	1%	0.8%	4.59%	Negative	Negative	Negative	Negative
2	National, regional economic development from the project	EIRR	14.1%	11.6%,	10.59%	13.33%	12.36%	12.09%	11.8%.	14.00%	12.09%	6.2%
3	Urgency of the project to reduce congestion	ETA20	129612	116000	42515	57250	24264	39573	45000	73358	84830	72655
4	Role of the road in network development	Connectivity	High	Very High	Very High	High	High	High	Medium	High	Medium	Medium
5	Project cost (USD) Million	Project cost	321.5	360	743.8	906	600	257.1	213	535	916	300

The scores values of the projects which were selected for second screening are given in Table 5.7. It is assumed that all criteria are having same weightages in decision making. Thus, total score of the project can be calculated from individual scores.

Table 5.7 Project score based on screening criteria

	Project	Indicator	CKE	PAEP	NKB Phase 2	SE	CE (M- K)	NKB Phase 1	RE	OCH 3	CE (K- M)-	SEE
1	Financial viability	FIRR	4	8	4	4	4	4	0	0	0	0
2	National, regional economic development from the project	EIRR	7	4	4	7	7	7	4	7	7	4
3	Urgency of the project to reduce congestion	ETA20	10	10	7	7	7	7	7	10	10	10
4	Role of the road in network development	Connectivity	7	10	10	7	7	7	4	7	4	4
5	Project cost (USD)	Project cost	10	10	10	10	10	10	10	10	10	10
	Score		38	42	35	35	35	35	25	34	31	28

From the scoring of projects in Table 5.7, Port Access Elevated Project can be selected as best PPP viable project in Sri Lanka. Other criteria which are not included in the secondary screening also endorsing the project as follows.

1. Private land acquisition of the project is zero since the land is belonging to Ports Authority.
2. There are any direct resettlements from the project.
3. The project is not passing through environmentally sensitive trace.
4. The project can bring positive impact to other expressways such as NKB-Athurugiriya, Colombo Katunayeke.

6.0 DISCUSSIONS

The framework can be considered as a dynamic document to assist Highway PPP projects screening in Sri Lanka. But this framework can be revised based on the recommendation of the implementation authorities.

6.1 Limitations of the Research

The questionnaire survey was carried out from only nine (9) respondents. Non availability of PPP and highway background experts was one of the limitations to select respondents.

In this research, no qualifier was identified for preliminary screening criteria indicators. For the elimination of projects using preliminary screening criteria, threshold value needs to be identified.

After the secondary screening, there should be a minimum threshold score for selection of projects. The purpose of this threshold value is to make sure that no unqualified projects are being selected in the screening process.

From the literature review of other guidelines in section 2.10, it is learned that it is important to identify weightage score for each criterion. Since the importance of the criteria is different for each criterion, weightage can be used to represent that in decision making. But in this study no all the criteria were given equal weightage.

Major limitation in this study is that there are not any successfully completed PPP road projects in Sri Lanka, to compare our study and the real-world project scenario.

In addition, another limitation was the lack of availability of detailed documentation in the projects.

6.2 PPP Project Constraints in Sri Lanka

The constraints in Sri Lanka for acceleration of PPP projects were identified from literature review and interviews. This information will help to develop any documents related to PPP such as guidelines.

1. One of the constraints to adopt PPP in Sri Lanka is, unstable political environment and frequent policy changes. So, it would be difficult to adopt PPP projects with political risks. For example, New Kelani- Athurugiriya Elevated Road was under concessionaire selection stage in 2019, but after the change of government this project was changed as an unsolicited project.
2. Investors are not motivated with subsidies. Preferential tax policies need to be established to attract private partners.
3. The bankability of projects is a crucial problem for Sri Lankan PPP projects.
4. Due to urgency of the projects with political reasons, PPP is not considered in SL. Availability of loan (Even with high interest rate) with grace period demotivates PPP in SL.
5. There is not any legal infrastructure in the country for private partnership including procurement method.
6. Unsolicited projects are given high priority than solicited projects. While analyzing the PPP projects cases in Sri Lanka, unsolicited proposals are big hurdle to carryout best PPP practices in the country. For example, for Northern Expressway the FNPV calculated for stage 1 Colombo – Mirigama and Stage 2 Mirigama - Kurunagela was -739 million by China Merchants Group where, these calculations were carried out the prospective private party. So, the reliability of the revenue and estimations may not be credible. Thus, unsolicited projects may reduce the benefits of PPP. The unsolicited projects need to be treated with Swiss Challenge Model.
7. Absence of Toll related policy in Sri Lanka.
8. The affordability to pay tolls is key issue in setting user charges. The Willingness to Pay survey can be used in user charge determination.

9. In Sri Lanka, revenue of the expressway is only expected from the tolls. When a region does not achieve the expected growth after the project, the toll revenue cannot be obtained as expected in the studies. Thus, it can cause the projects to fail when that region very much depends on the revenue for future economic development of the region.
10. The uncertainty in traffic estimation prevail due to change in political proposals. For example, a change in public transportation policy can change the traffic numbers. Developed countries have more long-term plan than developing countries. This makes difficult to estimate for more than 10 years for developing countries.

6.3 Suggestions from Respondents for Project Screening

In addition, other suggestions criteria to be considered in project selection were collected from respondents.

1. Projects which other conventional financing sources showing a reluctance to finance can be considered for PPP projects
2. The benefits to the franchisee other than the core business (transport) can be considered in project selection
3. Creating a balanced development among various regions of the country
4. Bankability for private investors to raise required funds
5. Competitive bidding process based on sound documentation
6. Expert PPP negotiating team required (not available in GOSL)
7. The non-availability of funds in the public sector and inability of obtaining project funding
8. Private agency capability in Managing Project
9. Project marketability
10. Political impact

Political impact is not considered in the research criteria, as it is not project specific and common factor for all projects in the country. However, from the interviews it was found that, in local context politically endorsed projects have more priority.

7.0 RESEARCH FINDINGS

7.1 Development of Screening Criteria

In Sri Lanka, there is not a separate guideline available for Highway PPP projects. Two-phase screening criteria were used for PPP projects by NAPPP. In the first phase, project readiness, investment cost, public investment plan, meeting PPP guideline and the sector executing the project will be considered. In second phase, GoSL priority, management/ technical gaps and service levels, line ministry readiness, status of project preparation, project implementation timeline (less complex projects), project feasibility, financing, private sector appetite and availability of information are considered.

In order to identify criteria for candidate PPP selection, seven (7) user guidebooks were referred. Furthermore, critical factors for success and failure of PPP were identified from the research. Less lucrative projects, low population in cities, uncertainty in traffic volume, cost and revenue risks, inappropriate risk allocation between private and public partners, land acquisition, resettlements, political instability and loss of traffic due to other proposals were identified as critical failure factors.

A multi attribute analysis was used in the research. In this method the criteria were divided into subpackages, and weightages and scores were given to each criterion to calculate total scores. In the research ranks within each subpackages and best six criteria for screening were collected from questionnaire survey.

From the questionnaire survey analysis, a better representing criterion was selected to represent demand, financial, risk and scale subpackages. These criteria used to develop prescreening criteria. The following preliminary screening criteria was shortlisted.

1. Urgency of the project to reduce congestion
2. National, regional economic development from the project
3. Financial viability
4. Land acquisition
5. Project cost

Further, nine (9) secondary screening criteria was shortlisted for selection of candidate PPP projects. Secondary criteria and suggested scores are given below in the ranking order by respondents.

1. Financial viability - Maximum recommended score is 17
2. Long range revenue potential from the project – Maximum recommended score is 10
3. Transfer of significant Operational & Management risk to private team - Maximum score recommended is 10
4. National, regional economic development from the project - Maximum score recommended is 9
5. Urgency of the project to reduce congestion - Maximum score recommended is 8
6. Design of the project to achieve best practice by PPP - Maximum score recommended is 5
7. Cost and revenue risks - Maximum score recommended is 4
8. Role of the road in network development - Maximum score recommended is 4
9. Project cost - Maximum score recommended is 4

Financial viability of the project was identified as key criterion for selection of PPP projects. FIRR can be used to identify financial viability of projects. The long-range revenue potential can be represented by PV of the revenue during the operation period. The transfer of Operational and Management risk can be indicated by risk in monetary term transferred to private party from PPP arrangement. The Nation, regional, economic development can be represented by EIRR or BCR of the project.

Furthermore, to represent demand of the project urgency, reduction in traffic congestion can be used. PCU/day can be used to identify this criterion. Design of the project to achieve best practice by PPP is represented by qualitative indicators. Construction complexity of the project can be used to represent the criteria.

Cost and revenue risks are identified as a key failure factor. Thus, projects that comes with more cost and revenue risk should be excluded from PPP candidate list. Role of the particular project in the road network is considered as a criterion in the secondary screening. The national integration from the project can be considered in screening by

including the criterion. Functional importance of the road can be used to indicate the criterion.

Whereas Project cost can be considered as scale representing criterion. In Sri Lanka, due to the preparation involved in PPP, the threshold value for PPP project is set as USD 50 Million.

Even though land acquisition and resettlements are considered as key PPP project failure factor, from the questionnaire analysis it was evident respondents felt it was not the most important criteria. The reason for this was found in the interview that with existing laws and regulation in the country land acquisitions can be managed by the institution.

User charges was not selected as a top 6 factor by any respondents. Since this can be decided by the management, with a proper willingness to pay for survey, appropriate charges can be determined. Currently there is not any toll road related policy available in Sri Lanka. This makes it difficult for user charge evaluation for projects.

VfM analysis is recommended to carryout in the final screening due to the data required for the analysis. There are many tools to analyze VfM analysis. Public Sector Comparator and Shadow Bid Model tools were used by NAPPP.

Project readiness was included in the existing two-phase selection method in Sri Lanka. Conceptual level project will have less information compared to detailed designed project. This criterion is included in Philippines guideline as well.

7.2 Recommendations to Improve PPP Screening in Sri Lanka

From the questionnaire, recommendations to improve screening of Highway PPP projects were collected. These recommendations are listed below.

1. Financial analysis of the projects needs to be carried out before the selection of projects with high accuracy.
2. Technical, Financial, Social and Environmental evaluation committee should be established.
3. Private sector should be involved in the selection process to analyze the situation better.
4. Bankability should be carried out by international independent experts.

5. The toll roads in Sri Lanka can be used for asset recycling to secure funds for future development, thus not only Greenfield but also Brownfield PPP projects investment can be considered.
6. The success of the project depends on the investor who should have the capability to find the money and invest. Therefore, the PPP model should be selected carefully to balance both client and investor.
7. Build PPP structuring capability within the Finance Ministry and follow International best practice in PPP procurement process.

From the interviews the existing Expressway project selection methods were identified. Currently the line ministry considers the regional growth from expressways as a key factor for the project selection. The feasibility study targets to identify the economic viability of the projects. Project with more than 10% EIRR (previously it was 12%) are negotiated and targeted for soft loans. The financial viability of the project is neglected in many cases.

For screening of PPP projects, the information should be collected from the following analysis.

1. Economic analysis
2. Financial analysis
3. Risk analysis
4. Technical analysis
5. Market analysis
6. Environmental analysis
7. Stakeholder analysis
8. Institutional analysis
9. Value for Money analysis

Support from the government for land acquisition and environmental clearances is expected in PPP development. This risk should be accepted by Public entity to make the project more negotiable. Therefore, land and environmental clearances taken care

of prior to the selection process of PPP partners to minimize the unnecessary delays in projects.

7.3 Comparison of Completed, Ongoing and Future Projects as PPP Candidate

Based on the financial viability, national economic development, urgency of the project to reduce traffic congestion, role of the highway in network and project cost Colombo-Katunayake Expressway, Southern Expressway, New Kelani to Rajagiriya Elevated Road (Phase I), New Kelani to Athurugiriya (Phase I and II), Port Access Elevated Highway, Central Expressway Meerigama to Kurunagela Section, Ruwanpura Expressway Project, Southern Extension Expressway Project, Outer Circular Highway Section 3 and Central Expressway Kadawatha Mirigama Section 1 have been evaluated using secondary screening criteria. From the total score of the project Port Access Elevated Highway (42/62 score) is the best candidate road of all the considered projects and could have been considered as a candidate PPP project.

8.0 RECOMMENDATIONS

Identification of qualifiers for indicators of preliminary screening criteria of urgency of the project to reduce congestion (PCU/day) and national, regional economic development from the project (EIRR), financial viability (FIRR), land acquisition (percentage of the total project land need to be acquired from private parties), project cost (project cost) is recommended for further study.

A threshold score is recommended to identify for projects after secondary screening. A qualifier threshold score value will help to select only good projects after screening. Weightages for each criterion should be studied and developed for the better screening of projects.

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10.0 APPENDICES

Appendix 1: Questionnaire Format

 University of Moratuwa Faculty of Engineering Department of Civil Engineering M.Eng. in Highway & Traffic Engineering								
Date	DD/MM/YY	QUESTIONNAIRE: CRITERIA TO IDENTIFY CANDIDATE ROADS FOR PUBLIC PRIVATE PARTNERSHIP DEVELOPMENT						
Time								
Agency								
Venue								
1. Have you engaged in PPP Project selection or appraisal ?		Yes	No					
I) If "NO" please specify other types of funded Highway Project you have engaged?							
II) If "YES", please specify your project?								
Please Rank the Key criteria to select the PPP Road Projects in each category								
2. What are the demand related criteria which can be used in PPP Project selection (Provide Rank 1 for most important criteria and Rank 5 for least important criteria)		Urgency of the project to reduce congestion	National, Regional Economic Development from the project	National, Regional Social Benefits	Role of the road in network development	Safety needs		
3. What are financial related criteria which can be used in PPP Project selection (Provide Rank 1 for most important criteria and Rank 4 for least important criteria)		Financial Viability (NPV and IRR)	User pricing (Toll rates)	Long range revenue potential from the project	Impact of Project on viability of existing toll roads			
4. What are risk related criteria which can be used in PPP Project selection (Provide Rank 1 for most important criteria and Rank 7 for least important criteria)		Value for Money from the project	Land Acquisition	Resettlements	Design of the project to achieve best practice by PPP	Project Meeting Environment Safeguards	Cost and Revenue Risks	Transfer of significant Operational & Management risk to
5. What are scale related criteria which can be used in PPP Project selection (Provide Rank 1 for most important criteria and Rank 4 for least important criteria)		Project Cost	Project Design and Construction complex	Project Functional Scope	Public Agency Capability in funding the project			
6. Do you suggest any other criteria to be considered in PPP project selection other than the above mentioned?		1	2	3	4			
Please Provide most important criteria to be considered in PPP Project Selection (from the suggested criteria above) and the rating you willing to provide for each criteria in 1-10 scale		1	2	3	4	5	6	7
Any suggestion to improve selection of PPP Highway Projects in Sri Lanka								
						<i>Thank You For Your Valuable Time</i>		

Appendix 2: Weightages Based on the Criteria by Philippines Guideline

	Category	Criteria	Maximum Weightage	Evaluation Details
1	Necessity and Urgency of the Project	Economic viability	15	EIRR > 25% - Weightage-15 15% < EIRR < 25% - Weightage-12 EIRR < 15% - Weightage-5
2		Functional importance of the highway	6	Backbone road = 6.0 Distributor road = 4.0 Branch of backbone road = 2.0 Independent road = 1.0
3		Contribution to national/regional economic development	2	Tourism/Fishery/ Manufacture/ Commercial industry = 1 If more than 2 industry maximum weightage 2
4		Contribution to national/regional social Development	3	Poverty incidence over 30% = 3.0 Poverty incidence between 20-30% = 2.0 Poverty incidence less than 20% = 1.0
5		Contribution to traffic decongestion	6	PCU/Hour > 4000 = 6 1000 < PCU/Hour < 4000 = 4 PCU/Hour > 1000 = 2

6		Project readiness		<p>Detail design Ongoing/Completed = 8</p> <p>Feasibility Completed/Ongoing = 7</p> <p>Pre-Feasibility Completed/Ongoing = 6</p> <p>Conceptual stage = 2</p>
7	Profitability	SPC's profitability	10	<p>IRR for SPC Over 20% = 10</p> <p>15% IRR for SPC 20% = 9</p> <p>13% IRR for SPC 15% = 8</p> <p>IRR for SPC Less than 13% = 4</p>
8		Equity investor's profitability	3	<p>Equity-IRR Over 20% = 3</p> <p>15% Equity-IRR 20% = 2</p> <p>13% Equity-IRR 15% = 1</p> <p>Equity-IRR Less than 13% = 0</p>
9		Relief of government's financial burden	10	<p>Cost saved by the government; over 50% = 10</p> <p>40% - 50% = 8</p> <p>30% - 40% = 6</p> <p>Less than 30% = 4</p>
10		Potential project cost risk (cost increase by 10%))	3	<p>Change SPC's IRR</p> <p>Over 20% = 3</p> <p>15% - 20% = 2</p> <p>13% - 15% = 1</p>

				Less than 13% = 0
11		Potential project revenue risk (Revenue decrease by 10%)	4	Change SPC's IRR Over 20% = 4 15% - 20% = 3 13% -15% = 1 Less than 13% = 0
12		ROW acquisition	10	Land to be acquired <u>Urban Land</u> Less than 5.0 ha = 10 5.0 -10.0 ha = 7 10.0 - 20.0 ha = 4 Over 20 ha = 2 <u>Rural Land</u> Less than 50.0 ha = 10 50 - 100.0 ha = 7 100.0 - 200.0 ha = 4 Over 200.0 ha = 2
13		Social impact	10	Number of structures affected Less than 200 = 10 200 - 400 = 7 400 -800 = 4 Over 800 = 2
14		Natural environment	5	Does not pass near environmentally sensitive area = 5

				Pass near environmentally sensitive area - 2
15		Construction difficulty	5	Rural/ at-grade = 5 Urban/ at-grade = 2 Urban/ elevated = 1

Appendix 3: Garrett Ranking Conversion Table

GARRETT RANKING CONVERSION TABLE

The conversion of orders of merits into units of amount of "soces"

Percent	Score	Percent	Score	Percent	Score
0.09	99	22.32	65	83.31	31
0.20	98	23.88	64	84.56	30
0.32	97	25.48	63	85.75	29
0.45	96	27.15	62	86.89	28
0.61	95	28.86	61	87.96	27
0.78	94	30.61	60	88.97	26
0.97	93	32.42	59	89.94	25
1.18	92	34.25	58	90.83	24
1.42	91	36.15	57	91.67	23
1.68	90	38.06	56	92.45	22
1.96	89	40.01	55	93.19	21
2.28	88	41.97	54	93.86	20
2.69	87	43.97	53	94.49	19
3.01	86	45.97	52	95.08	18
3.43	85	47.98	51	95.62	17
3.89	84	50.00	50	96.11	16
4.38	83	52.02	49	96.57	15
4.92	82	54.03	48	96.99	14
5.51	81	56.03	47	97.37	13
6.14	80	58.03	46	97.72	12
6.81	79	59.99	45	98.04	11
7.55	78	61.94	44	98.32	10
8.33	77	63.85	43	98.58	9
9.17	76	65.75	42	98.82	8
10.06	75	67.48	41	99.03	7
11.03	74	69.39	40	99.22	6
12.04	73	71.14	39	99.39	5
13.11	72	72.85	38	99.55	4
14.25	71	74.52	37	99.68	3
15.44	70	76.12	36	99.80	2
16.69	69	77.68	35	99.91	1
18.01	68	79.17	34	100.00	0
19.39	67	80.61	33		
20.93	66	81.99	32		