

Framework for Enhancing Sustainability of PPP Procurement Process for Infrastructure Development

A THESIS

Submitted by

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DOCTOR OF PHILOSOPHY



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Statement

I hereby declare that the work presented in this thesis is to the best of my knowledge, original, except as acknowledged in the text. This material has not been submitted, either in whole or in part, for degree at any University.

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Certificate

This is to certify that the thesis entitled “**Framework for Enhancing Sustainability of PPP Procurement Process for Infrastructure Development**” submitted by **Nilesh Agarchand Patil** (Registration No. 11610431) to Indian Institute of Technology Guwahati for the award of degree of Doctor of Philosophy is a record of the bonafide research work carried out by him under my supervision and guidance. The thesis work, in my opinion has reached the requisite standard fulfilling the requirement for award of the degree of Doctor of Philosophy. This work has not been submitted earlier for the award of any degree or diploma to the best of my knowledge and belief.

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ABSTRACT

Public-private partnerships (PPPs) have become one of the preferred procurement routes for governments to develop infrastructure, in view of the budgetary constraints faced by them and the efficiency gains provided by the private sector. Since the private sector is driven by profit-generation motives to enter into a PPP arrangement, there are criticisms against PPPs for focusing on economic goals and financial targets while giving less emphasis to attainment of social objectives. Another criticism is that sustainability has not been a key focus in PPPs as sustainable development principles are largely absent from the theory and frameworks that underpin and direct PPP action. As a result, infrastructure development through PPP will fail to promote sustainable development goals. One of the ways to overcome these criticisms is to modify the existing PPP procurement process in order to attain the sustainable infrastructure development goals. The basic aim of this research is, therefore, to develop a framework highlighting the strategies for integrating sustainability principles in the procurement process of PPP projects.

The study has used a qualitative research approach to develop the framework of strategies, which are classified with respect to various shortfalls of PPP process. The framework of strategies developed in this study is based on findings from the secondary data source of literature review and corroboration with the primary data source of 18 Indian stakeholders. The resulting framework defined the enhancement of PPP procurement with respect to eleven categories, representing the shortfalls in PPP process relating to environmental impact assessment, value for money analysis, stakeholders' participation, skill and knowledge of sustainability concepts, incentives to private sector, bid preparation and evaluation, user charges for infrastructure services, risk allocation and mitigation in model concession agreement, bidding and transaction cost, transparency and accountability during bidding, and relationship of public and private sector. Further, the inter-relationships between formulated strategies and shortfalls of PPP procurement process have been defined through qualitative system dynamics model using causal loop diagrams. The study concludes through the system dynamics modeling that the inclusions of these strategies under the respective shortfalls have improved the system behavior with key deliverables of PPP process with development of positive/reinforced feedback loops. On the basis of qualitative inputs from experts, the strategies could be recommended for

integration into the respective shortfalls of PPP procurement process in order to accomplish the sustainable infrastructure development goals.

The proposition of this study through the framework of strategies could be an effective tool for policy maker and transaction advisors of PPPs in restructuring of the PPP procurement process so as to accomplish the goals of sustainable infrastructure development. The framework developed in this study has focused mainly on PPP procurement practices in the context of infrastructure development in India. The feasibility of including these strategies in another contextual environment of other countries using PPP as the preferred mode of infrastructure development needs to be studied. Further study in another context would increase the usefulness and enhance the applicability from practitioners' perspective.



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LIST OF ABBREVIATIONS

ACID	Australian Council for Infrastructure Development
ADB	Asian Development Bank
APCC	Australian Procurement and Construction Council
BEQUEST	Built Environment Quality Evaluation for Sustainability through Time
BIM	Building Information Modeling
BOO	Build-Own-Operate
BOOT	Build-Own-Operate-Transfer
BOT	Build-Operate-Transfer
BRE	Building Research Establishment
BREEAM	Building Research Establishment Environmental Assessment Method
CA	Concession Agreement
CAQDAS	Computer Assisted Qualitative Data Analysis Software
CAs	Conceptual Areas – Shortfalls in PPP process
CASBEE	Comprehensive Assessment System for Built Environment Efficiency
CAGI	Comptroller and Auditor General of India
CCA	Classical Content Analysis
CCCs	Climate Change Considerations
CEC	Commission of The European Communities
CEE	Centre for Environment Education
CEEQLAL	Sustainability Assessment, Rating & Awards Scheme for Civil Engineering
CI	Construction Industry
CII	Confederation of Indian Industry
CIPS	Chartered Institute of Purchasing and Supply
CLDs	Causal Loop Diagrams
CPs	Core Principles
CSFs	Critical Success Factors
DBFM	Design-Built-Finance-Maintenance
DBFO	Design-Build-Finance-Operate

DBO	Design-Build-Operate
DEA	Department of Economic Affairs
DME	Department Minerals and Energy
DOIT	Department of Infrastructure and Transport
DTF	Department of Treasury and Finance
EFSG	Environmental-friendly and Smart-growth
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EOI	Expression of Interest
E&S	Environmental and Social
EMS	Environmental Monitoring System
EPC	Engineering Procurement Contract
EPEC	European PPP Expertise Centre
EPSU	European Federation of Public Service Unions
FIRE	Financial Institution Reform and Expansion Program
FDI	Foreign Direct Investment
FIs	Financial Institutions
FPOs	Fairness and Process Auditors
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GMDA	Guwahati Metropolitan Development Authority
GRIHA	Green Rating for Integrated Habitat Assessment
GPs	Guiding Principles
GSs	Government/Public Sectors
IAIA	The International Association for Impact Assessment
ICES	Index of Structures' Contribution to Sustainability
IISD	International Institute of Sustainable Development
IIPDF	India Infrastructure Project Development Fund
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature

LCA	Life Cycle Assessment
LEED	Leadership in Energy and Environmental Design
MIA	Micro-interlocutor Analysis
MCA	Model Concession Agreement
MDSs	Millennium Development Goals
MHEENG	Manitoba Hydro Electric Energy and Natural Gas
MNRE	Ministry of New and Renewable Energy
MoEF	Ministry of Environment and Forests
NAS	National Academy of Science
NGOs	Non-Government Organizations
NEPA	National Environmental Policy Act [42 U.S.C. 4321]
NSDSS	National Sustainable Development Strategy Serbian
NSESD	National Strategy for Ecologically Sustainable Development
NVivo	QDA Computer Software Package Produced by QSR International
OECD	Organization for Economic Co-operation and Development
OM	Operation-Maintenance
O&M	Operations and Maintenance
OSE	Office of Sustainability and Environment
PCSD	President's Council on Sustainable Development
P&D	Planning and Development
P&E	Procurement and Evaluation
PFI	Private Finance Initiatives
PPI	Private Participation in Infrastructure
PPIAF	Public Private Infrastructure Advisory Facility
PPP	Public Private Partnership
PPPs	Public Private Partnerships
PSB	Public Sector Benchmark
PSC	Public Sector Comparator
PSs	Private Sectors
PWC	Price-water-house-Coopers

PWD	Public Works Department
QDA	Qualitative Data Analysis
QOL	Quality of Life
QSR	Qualitative Research Software, Developer Based in Melbourne
RAE	Royal Academy of Engineering
RC	Relational Contracting
RFP	Request for Proposal
RFQ	Request for Qualification
SCP	Strategic Communication Plan
SD	Sustainable Development
SIA	Social Impact Assessment
SEA	Strategic Environmental Assessment
SID	Sustainable Infrastructure Development
Sl. No.	Serial Number
SPC	Special Purpose Company
SPV	Special Purpose Vehicle
SPSS	Statistical Package for the Social Science
SWM	Solid Waste Management
TAs	Transaction Advisors
TBL	Triple Bottom Line
TERI	The Energy and Resources Institute
TSI	Technical Sustainability Index
UBC	The University of British Columbia
ULBs	Urban Local Bodies
UK	United Kingdom
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCSD	United Nations Commission for Sustainable Development
UNDES	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Program

UNECE	The United Nations Economic Commission for Europe
UNEP	United Nations Environmental Program
UNESCAP	The United Nations Economic & Social Commission for Asia & Pacific
UNGA	United Nations General Assembly
UN-HABITAT	United Nations Human Settlements Program
US	United States
USA	United States of America
USDOT	United States Department of Transportation
U. S. EPA	United States Environmental Protection Agency
Vensim PLE	System Dynamics Software for Personal Learning Edition
VfM	Value for Money
VGf	Viability Gap Funding
WB	World Bank
WCED	World Commission on Environment and Development
WEF	World Economic Forum
WLC	Whole Life Costing
YRGM	York Region Growth Management
AGENDA 21	Agenda of Action for the 21st Century – action agenda published by the United Nations following the Conference on Environment and Development, Rio-de-Janeiro, June 1992



CHAPTER 1

INTRODUCTION

1.1 Background and Need for the Study

Sustainable development has become a concept which all governments, organizations, and industries seemingly aspire to abide by while formulating the growth strategy. Subsequent to Rio de Janeiro Summit in June 1992, various governments have set up programs and enacted policies to meet the objectives of sustainable development. The government of India has also enacted policies and initiated programs to implement its commitment to the principles and goals of sustainable development (MoEF 2011). These policies and programs have been designed to fulfill its commitment towards social progress, accelerated economic growth, and increased environmental conservation. One of the key initiatives undertaken by Indian Government for accelerated economic growth is the development of key infrastructure sectors such as highways, ports, power and urban infrastructure through increased private sector participation using the public-private partnerships (PPPs) route. PPPs have enabled the cash-strapped governments to build the much-needed infrastructure. Governments have laid emphasis on infrastructure development on account of its spill-over effects such as poverty alleviation, increased international competitiveness, and improved productivity and these spill-over effects help in fulfilling the goals of sustainable development while limited access or low-quality infrastructure has a far greater adverse impact on the poor than the rich (Fay et al. 2011).

However, there exist various issues that adversely affect the fulfillment of sustainable development goals when projects are procured through PPP route. For instance, Siemiatycki (2013) mentioned that private investments guided by market imperatives exacerbate unequal development and social marginalization. El-Gohary et al. (2006) have cautioned that involvement of private sector in PPPs, on account of its profit-making mindset, raises critical sustainability issues that are not normally encountered while procuring projects through the traditional route. Two of the key principles necessary for promoting sustainable development goals are intra-generational equity and inter-generational equity, but PPPs fail to protect society's interest with respect to these two principles (Clifton and Duffield 2006). Intra-generational equity, in a case of infrastructure projects, can be defined in terms of distributional equity (ensure that those who benefit

from infrastructure share the costs and that those who are disadvantaged are compensated) and access equity (ensure socially desirable access to infrastructure is maintained). PPPs, however, are a preferable option for the private sector when it focuses on providing 'premium network' connections in high-value locations, while less profitable projects and remote geographical locations are often overlooked (Graham and Marvin 2001). Another issue related to intra-generational equity mentioned by Cheung (2009), one of the major common complaints by the general users against PPP projects is the high tariffs charged for the services provided by the private sector, which will make it inaccessible of infrastructure facility to some sections of the society. Inter-generational equity, in a case of infrastructure projects, refers to fairness in the allocation of resources between current and future generations. Promotion of inter-generational equity in the context of PPPs will mean that cost of infrastructure is fairly distributed over the life of the asset such that current users do not have to pay in advance for future demand and that future generations are not penalized for today's decisions.

However, PPPs involve long-term commitments of public finances and private investment resulting in transferring of massive liabilities to future generations. Regeczi (2005), based on the analysis of different types of PPP infrastructure projects, has concluded that governments are yet to use PPPs to show concerted leadership on environmental and social protection practices. Further, PPPs have also been criticized on various aspects of sustainability. For instance, Hill and Collins (2004) stated that the current bid evaluation criteria for PPPs have not considered the social and environmental aspects during bid evaluation. Based on the examination of global legislation in PPPs, Ryan (2004) has also concluded that sustainability has not been a key focus in PPPs as sustainable development principles are largely absent from the theory and frameworks that underpin and direct PPP action. Rather, PPPs should embed environmental and social safeguards in their goals, designs and specifications, tender evaluation, supplier selection, and monitoring and contract functions (Samuel and Oshani 2012). Incorporating sustainability principles in the procurement of infrastructure projects through PPP mode could lead to the development of better infrastructure, bring more benefits to the better society and improve the quality of the environment (Samuel and Oshani 2011). Similarly, different studies have explored the possibility of integrating sustainability principles in various activities and processes of PPP procurement. The various possible activities and processes are tender evaluation, supplier selection, and monitoring and contracting functions (Samuel and

Oshani 2011), VfM estimation (Lockie 2003), planning and the delivery stages (PWC 2008), bid evaluation (Hill and Collins 2004), and across PPP life cycle (Samuel and Oshani 2012; UNECE 2008).

Indian Government, like other developed and developing countries, has adopted PPPs as one of the preferred routes for development of infrastructure projects since the economic liberalization initiated in 1991 (Ministry of Finance 2014). Since then, Government of India has been able to attract private sector participation through PPPs and has developed 249 different types of infrastructure projects up to 2006 (Lakshmanan 2008). In the 11th Five Year Plan (2007-2012), the total investment in infrastructure was INR 2,424,277 crore (US\$ 404 billion @ INR 60/US\$), wherein the private sector contributed about 36% through the PPP route (Planning Commission 2013b). Amongst the countries which are actively pursuing PPPs as the preferred route for infrastructure development, India has registered second only to China and Brazil in terms of the number of PPPs developed and in terms of investment, respectively. Thus, the India is the largest market for PPPs and has been the top recipient of private participation in infrastructure (PPI) activity since 2006, implementing 43 new projects which attracted a total investment of US\$20.7 billion in 2011 (Planning Commission 2013a). Recently, the Indian government has adopted a strategy to increase the share of private investment in infrastructure development through various forms of PPP in the 12th Five Year Plan (Planning Commission 2011). As per the 12th Five Year Plan (2012-2017), the proposed investment in infrastructure has been estimated to be around US\$ 1 trillion with a plan to attract half of the required investment from the private sector through PPP route (Planning Commission 2013b).

PPPs have enabled Indian governments to ease budgetary constraints and bridge the infrastructure demand-supply gap (Planning Commission 2010). Infrastructure sectors such as national highways, ports, airports, power, and urban infrastructure have attracted private sector investments through PPPs in India (Planning Commission 2013a). This has resulted in additional capacity and delivery of quality public services, but investments have been confined to providing infrastructure services in high-value locations, while the less profitable regions, such as North East regions, and project types, such as water and wastewater and other social sectors, have failed to attract enough private sector participation (Planning Commission 2008). Public sector unions have often resisted PPPs, fearing that PPPs will reduce jobs and conditions of employment while citizens and service users have raised concerns about having a service provider who is driven by the motive of

profit maximization (Bisht 2014; PTI 2014). As on March 2012, the value of completed PPP projects in India is INR 134,205 crore (US\$ 22 billion @ INR 60/US\$), wherein more than 80% (INR 109,073 crore/ US\$ 18 billion @ INR 60/US\$) of the investments has been in transportation sector while the investment in urban infrastructure has been limited to about 7% (INR 9801 crore/ US\$ 1.6 billion @ INR 60/US\$) (Planning Commission 2013a). The value of PPP projects by the governments in the North Eastern regions is a meager INR 133 crore (US\$ 22 million @ INR 60/US\$) as on March 2012. It will not be incorrect to say that the pattern of infrastructure development through the PPP route in India has been leading to unequal development and social marginalization. Infrastructure investments are normally undertaken with the objective to promote economic growth, address environmental concerns, and bridge the social disparity (Fay et al. 2010). However, PPPs expand market forces in infrastructure development and the greater focus on the private sector on furthering their financial interests takes precedence over other objectives associated with sustainable development. The Indian government, therefore, has focused on achieving growth in a sustainable and inclusive manner along with an emphasis on increasing private investment in infrastructure development through PPP route in the current 12th Five Year Plan (Planning Commission 2011). If government continues to adopt PPP as the preferred route for the development of sectors such as urban infrastructure, which, unlike transportation-related sectors, require a greater role for people in the on-going governance of the project, then the current process for PPP project development needs to be extended to allow people to play a greater role in the design and operation of the PPP project (Planning Commission 2011). The current PPP procurement process focuses on ensuring achievement of the economic goals and financial targets of the private sector, whereas social objectives have not been given due importance. As a result, similar to the criticisms raised by various civil societies and public sector entities in countries like the UK (UNISON) and Canada (Canadian Union of Public Employees) regarding the negative financial, environmental, and social consequences of PPPs, various organizations in India have also criticized PPPs for not promoting sustainable development. In India, for instance, the Federal Government plans to adopt the PPP route for modernization of Chennai and Kolkata airports in line with the development of the airports at other two metropolitan cities, New Delhi and Mumbai, on PPP basis has faced stiff resistance from the Airports Authority of India (AAI) (Bisht 2014). The reorientation of the PPP procurement process to give equal emphasis to attainment of social objectives along with the fulfillment of economic goals and financial targets will lead to a strategy

for infrastructure development that will promote sustainable development even when infrastructure projects are developed through PPPs.

The above-mentioned issues highlighted that the PPP program in India, though, has stabilized significantly with lessons learned from the experience of implementing PPP projects, but the PPPs in India still suffers from the certain shortfalls which could be related to the failure to meet many aspects of sustainable development principles. These studies have indicated that to ensure that development of infrastructure projects through PPP route also leads to sustainable development, there is a need for taking steps to integrate the concept of sustainability principles in PPP procurement process. One of the ways to overcome these shortfalls could be to modify the procurement process so as to fulfill the goals of sustainable development even when infrastructure is developed through PPP route.

PPPs have been the subject of various scholarly articles in various disciplines, which ranging from construction management to economics, law, and public administration. Till date, the majority of research on PPPs has focussed on themes relating to the logistics and design of PPP projects such as critical success factors; risk management; government regulation and guaranty; relationship between public and private sector; financing of PPPs; procurement and legal issues; and concession period and selection (Ke et al. 2009; Liu et al. 2015; Song et al. 2016; Tang et al. 2010; Zhang et al. 2016). An extensive body of literature also exists on criticisms of PPP arguing that private sector provision of infrastructure services leads to uneven patterns of economic development (Annez 2006; Siemiatycki 2006; Torrance 2008). The tendency of investors to limit to attractive infrastructure assets that provide premium service at an additional cost makes the service unaffordable for certain users (Graham and Marvin 2001). Koppenjan and Enserink (2009) have stated that the risk-averse attitude of the private investors make it probable that they will try to restrict their investments to profitable service areas. Hence, the most attractive infrastructure assets that investors tend to invest are the facilities that provide premium service levels at an additional cost, but the levying of a surcharge may make the facility access unaffordable for certain users. This highlights the concerns about the effectiveness of infrastructure development through PPP route in promoting sustainable development. Besides design and logistics of PPPs, few research studies have been undertaken on improving the performance of PPP such as sustainability performance measurement of PPP using key performance indicators (Zhou et al. 2013) and

sustainability performance-based evaluation model (Shen et al. 2016); VfM framework for improving investment sustainability of PPP power projects (Atmo and Duffield 2014); and sustainable teams' selection for PPPs (Kumaraswamy and Anvuur 2008). However, an empirical and inclusive study has not been undertaken to assess the effectiveness of infrastructure development through PPP route in promoting sustainable development, particularly in the Indian context. In view of the importance of various issues in PPPs and focus on performance measurement from a sustainable development perspective, it is very important for policy makers to modify the PPP procurement process from the sustainability perspective.

1.2 Problem Statement and Research Question

Public sector has successfully adopted PPPs as an alternative for infrastructure development in place of traditional procurement method. PPPs have provided the mechanism for the governments to rehabilitate aging infrastructure and develop new facilities to bridge the demand-supply gap. It has become clear that PPP procurement is an explicit procedure to achieve benefits such as risk transfer, increased efficiency, and bring in innovation. However, participation of private sector through PPPs has shifted the focus of infrastructure development towards meeting the business interests. As a result, the objective of fulfilling the interests of all the stakeholders, particularly general public, has been compromised to a certain extent on account of conflicting goals of the private sector.

PPP procurement process for infrastructure development has been to suffer from various shortfalls based on the preliminary review of literature. These shortfalls have resulted in failure to provide the appropriate framework wherein both the public agency and private player will strive to develop PPP projects which are not only economically viable but also perform satisfactorily from social and environmental perspectives to achieve the sustainable infrastructure development goals.

In view of the fiscal constraints faced by government and perceived efficiency gains from PPPs, PPPs will continue to be one of the approaches for infrastructure development. However, to ensure that infrastructure development through PPP route meets the objectives and goals for both private sector and the society, it is necessary to enhance the PPP procurement process. The attempt to enhance the PPP procurement process should be directed at achieving successful implementation of PPP infrastructure projects on

economic, environmental, and social dimensions. Therefore, the present study aims to gather evidence to answer the following research question: *How to enhance PPP procurement process using the concept of sustainable development?*

1.3 Research Aim and Objectives

The proposed study is to gain insights on the interrelationships between PPP mode of procurement of infrastructure projects and the concept of sustainable development. The main objective of the study is to formulate strategies to integrate the principles of sustainable development in the procurement process of PPP projects. This objective entails the following two sub-objectives:

- Examine the procurement process of PPP projects from the perspectives of sustainable development principles.
- Develop a framework of strategies to integrate principles of sustainable development in the procurement process of PPP projects.

Though PPP program in India has stabilized significantly with implementation of successful infrastructure projects, but it still suffers from shortfalls related to some aspects of sustainable development. Therefore, the scope of work is limited to PPP procurement process for infrastructure projects in India.

1.4 Contributions from the Research

The contributions from this study are listed as follows:

- The main purpose of conducting this study is to formulate the strategies for enhancing the deliverables/activities in PPP procurement process so that to accomplish the goal of sustainable development. The policy-makers and advisors of PPP projects from the developing countries will find the findings, particularly the strategies, from this study helpful in restructuring of PPP procurement process for developing more sustainable PPP projects.
- Another purpose of conducting this study is to establish the guiding principles that would provide a better tool for assessment of sustainability of PPP infrastructure projects to public and private sector officials. These guiding principles will act as a guideline to facilitate promotion of sustainable practices at various stages of

infrastructure project so that sustainable development goals can be achieved over the whole life cycle of the project.

- The ultimate purpose of conducting this study is to improve the current PPP procurement practices for infrastructure development in order to contribute to the sustainable development goals. It is expected that the enhancement of PPP procurement process will increase the applicability of PPPs in the less profitable regions (such as North East region of India), and other social infrastructure sectors such as water and wastewater.

1.5 Research Methodology

As the research question and objectives are descriptive in nature, the study, therefore, has used a qualitative research approach to answer the research question. In this research, the qualitative study was conducted using multiple research methods such as grounded theory and system dynamics modeling. The two sources of the data, secondary data from literature review and primary data from focused interviews, were used for the research inquiry. The qualitative data was analyzed through the coding procedure using various qualitative tools and techniques in NVivo10. The research inquiry adopted the following five research stages to answer the research question:

- **In stage 1**, an analysis of PPP procurement process was conducted through literature review in order to identify the shortfalls/conceptual areas that have hampered progress towards promotion of sustainability goals.
- **In stage 2**, the identified shortfalls/conceptual areas, then, guided the formulation of the preliminary framework of strategies on how to integrate sustainability principles in conceptual areas of PPP procurement process.
- **In stage 3**, the applicability of the preliminary framework was then evaluated through focused interviews with stakeholders to develop the final framework of strategies for improvement of PPP procurement process in the identified conceptual areas.
- **In stage 4**, the qualitative system dynamics model using causal loop diagrams (CLDs) has been developed to define the inter-relationships and dynamic behavior amongst the formulated strategies, conceptual areas and deliverables of PPP procurement process.

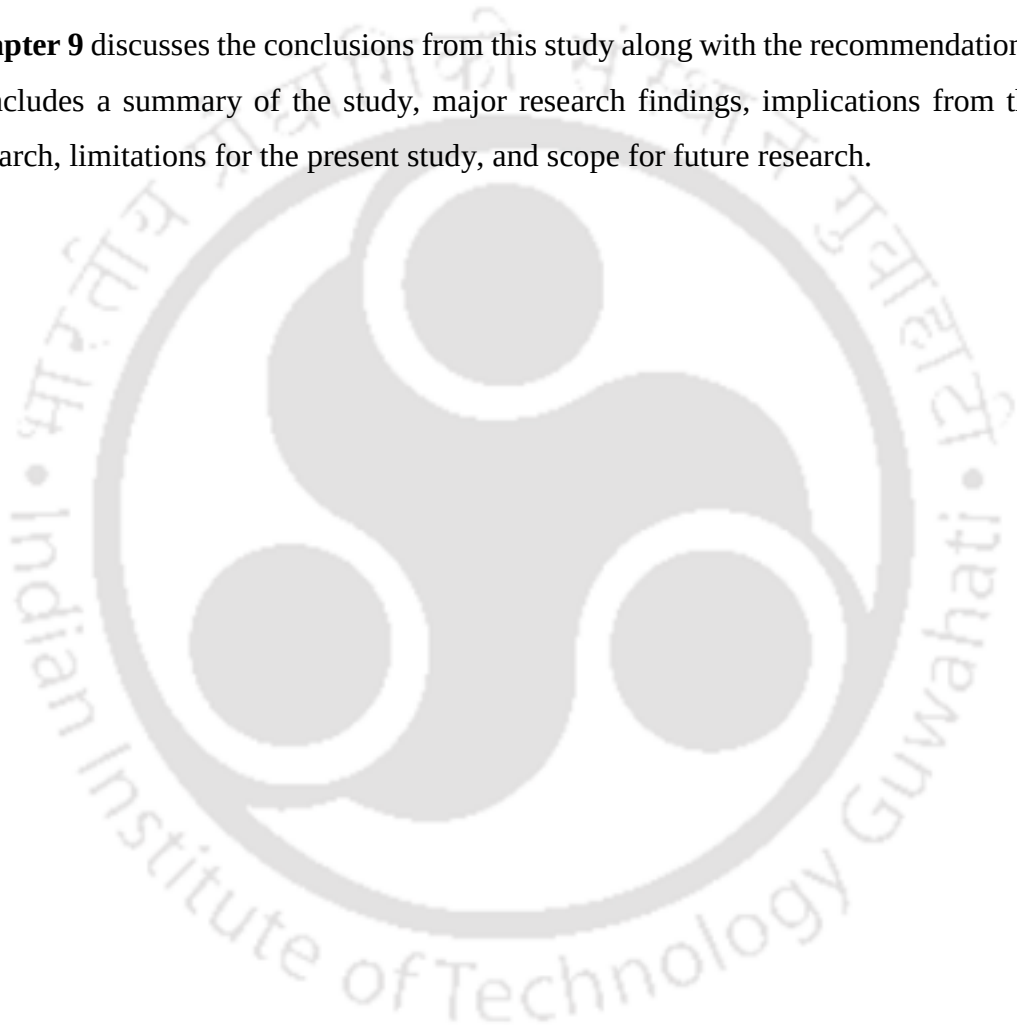
- **In stage 5**, the final framework was validated using six validation aspects through email-based survey with the same experts who had participated in the focused interviews.

1.6 Organization of the Thesis

This dissertation has been organized in nine chapters. The focus of these chapters is described briefly below:

- **Chapter 1** focuses on the background and need for this research, problem statement and research question, research aim and objectives, contributions from the present study, research methodology and organization of the thesis.
- **Chapter 2** discusses the key findings from literature review. The literature review has been divided into three sections: (i) PPPs for infrastructure development includes the details on PPP in general: basic concept, characteristics, benefits, and types; PPP in India: definition, development, and types; PPP procurement process in India, and details on past researches on PPPs; (ii) Sustainability and sustainable development includes the details on definition of sustainability and sustainable development, evolution of sustainable development concept, assessment of sustainability, and principles for sustainable development; and (iii) PPPs with sustainability perspectives includes criticism on PPPs with perspective of sustainable development and integration of sustainability in PPP procurement process to conceptualize the modified PPP framework.
- **Chapter 3** presents the details of the adopted research methodology. This chapter discusses the concept of research methodology and method, research methods used in the study, description of research stages, and steps of qualitative data analysis with tools and techniques used in this study.
- **Chapter 4** discusses the analysis of PPP procurement process from the perspective of sustainability principles using literature review through qualitative analysis.
- **Chapter 5** introduces the preliminary framework on how to integrate the principles of sustainability through strategies for enhancement of PPP procurement process using literature review through qualitative analysis.

- **Chapter 6** introduces the final framework of strategies to enhance the sustainability of the PPP procurement process for infrastructure projects through grounded theory using focused interviews.
- **Chapter 7** introduces the assessment of the causal behavior of the framework using qualitative system dynamics modeling through causal loop diagramming (CLDs).
- **Chapter 8** gives the details on validation of framework using six validation aspects through email-based survey protocol.
- **Chapter 9** discusses the conclusions from this study along with the recommendations. It includes a summary of the study, major research findings, implications from the research, limitations for the present study, and scope for future research.



CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents review of literature on the role of PPPs in promoting infrastructure development in both developed and developing countries. Further, the chapter presents the critical review on sustainable development concept from the perspective of infrastructure development and procurement protocol. The role of PPPs has also been critically examined from the perspective of sustainable development in order to ascertain the areas where the principles of sustainability have not been accomplished.

The basic concept of PPPs for infrastructure development has been the focus of the second section of this chapter. The section also explains the detail procedure of PPP procurement process in India, which has been used as unit of analysis for this study. Review findings on past studies on PPPs for the infrastructure development have also been discussed in this section to identify the research gaps in PPPs with respect to sustainable development. The third section gives the detailed review on sustainable development and sustainability. The basic concepts, assessment approaches and models for sustainability assessment have been the focus of this section. The section further explains the various principles of sustainable development, which have been used for the analysis of PPP procurement process. The last section discusses the current status on PPPs from the perspective of sustainability, criticism on PPPs from the perspective of sustainability and need for integration of sustainability principles/aspects in PPP process.

2.2 Public Private Partnerships for Infrastructure Development

2.2.1 PPPs in general

Basic concept of PPPs

At the beginning of 1990s, the public-private partnerships (PPPs) have been adopted as an alternative to traditional procurement by the government of developing and developed countries for infrastructure development. PPP is a procurement approach where public and private sector join forces to deliver a public service or facility. In this arrangement

normally both the public and private sector will contribute their expertise and resources to the project and share the risks involved (Cheung 2009). PPPs can also be described as a collaboration between public and private sectors, to provide public infrastructure, or other facilities and services (Josiah 2008).

Different definitions of PPP have been proposed by various organisations and the contents and objectives vary according to the country-specific background and the specific interests of the individual author. Some academic and industrial practitioners still regard the definition of PPP as being very ambiguous. In some cases, the term PPP describes a wide range of arrangements whereby government responsibilities are outsourced to commercial partners, and risk is shared between the public and private sectors to bring about desired outcomes in areas associated with the public policy (Alfen et al. 2009). Yescombe (2007) stated that the PPPs would be involving the following key elements:

- A long-term contract between a public-sector party and a private sector party;
- Design, construction, financing, and operation of public infrastructure (the facility) by the private-sector party;
- Payments over the life of the PPP contract to the private-sector party for the use of the facility, made either by the public-sector party or by the general public as users of the facility; and
- Facility remaining in public-sector ownership or reverting to public-sector ownership at the end of the PPP contract period.

Governments worldwide have increasingly turned to private sector to provide infrastructure services in energy and power, communication, transport and water sectors which were once delivered by the public sector. There are several reasons for the growing collaboration with the private sector in developing and providing infrastructure services through PPPs, which include (Alfen et al. 2009; UNESCAP 2008; UNESCAP 2011; Walker and Smith 1995):

- To remove the responsibility of funding the investment from the government's balance sheet;
- To introduce competition;
- To gain access to advanced technology;
- To adopt managerial practices and experience of the private sector;

- To restructure public sector service by embracing private sector capital and practices; and
- To achieve greater efficiency than traditional methods of providing public services.

Types of PPP Models

Various types of partnerships have been forged between public and private sector which reflects different project objectives and requirements. These partnerships generally vary in terms of the degrees of private involvement. A continuum that reflects the degree of private sector involvement in five of the commonly used PPP model is shown in Figure 2.1 (Kwak et al. 2009). The five types are briefly explained as below:

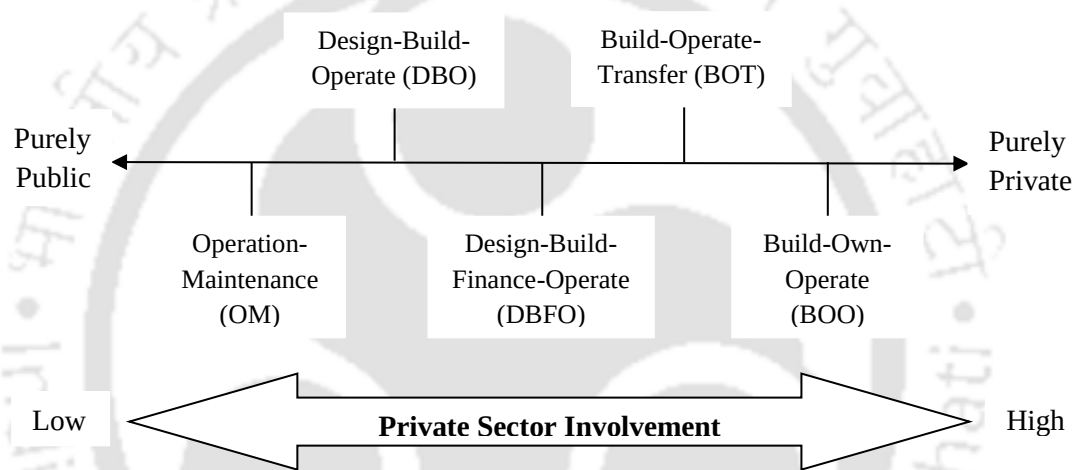


Figure 2.1: Continuum of Types of PPPs (Kwak et al. 2009)

- Operation & Maintenance (O & M) contract – The private sector is responsible for all aspects of operation and maintenance. Although the private sector may not take the responsibility of financing, it may manage a capital investment fund and determine how the fund should be used together with the public sector.
- Design-Build-Operate (DBO) – The private sector is responsible for the design, construction, operation, and maintenance of a project for a specified period prior to handling it over to the public sector.
- Design-Build-Finance-Operate (DBFO) – The private sector is responsible for the finance, design, construction, operation, and maintenance of a project. In nearly all cases, the public sector retains full ownership over the project.
- Build-Operate-Transfer (BOT) – The private sector is responsible for the finance, design, construction, operation, and maintenance of a project for a concession period.

The asset is transferred back to the government at the end of concession period, often at no cost.

- Build-Own-Operate (BOO) – The private sector finances, builds, owns and operates a facility or service in perpetuity. The public sector only agrees to purchase the services produced for a fixed length of time.

2.2.2 PPPs in India

The Department of Economic Affairs, Government of India has defined PPPs as an arrangement between a government/statutory entity/government owned entity on one side and a private sector entity on the other, for the provision of public assets and/or public services, through investments being made and/or management being undertaken by the private sector entity, for a specified period of time, where there is well-defined allocation of risk between the private sector and the public entity and the private entity receives performance-linked payments that conform (or are benchmarked) to specified and pre-determined performance standards, measurable by the public entity or its representative” (DEA 2011).

Along with the initiation of structural reforms in the country, the Government of India has announced the new industrial policy in 1991 to develop industrial and infrastructure sectors with more emphasis on private participation (Ministry of Finance 2014). The Government of India envisaged that the investment in infrastructure would increase to 8% of GDP by 2011-12 and the private sector investment would contribute approximately 1.2% of GDP (PPP Cell, 2012). Recently, the Government of India adopted the strategies on achieving growth in a sustainable and inclusive manner, along with the emphasis on increasing private investment in infrastructure development through the PPP route, in the current 12th Five Year Plan (2012-2017) (Planning Commission 2011). As per the 12th Five Year Plan (2012 – 2017), the required investments in infrastructure have been forecasted to be INR 5,574,663 crore (US\$ 929 billion @ INR 60/US\$) (Planning Commission 2013b). The Central Government has envisaged 48% of the required investment in infrastructure from the private sector through the PPP route. The growth in the number of PPP infrastructure projects during the last two and half decades has made India a leading PPP market in the global arena. The database maintained by the DEA (2015) indicates that there are currently over 1,200 PPP projects in various stages of development and implementation, with an estimated investment of Rs. 7.2 lakh crores.

2.2.3 PPP procurement process in India

The procurement process for developing infrastructure projects through PPPs in India has been developed by Planning Commission (2011) and further streamlined by the Department of Economic Affairs (DEA 2011) at the Federal Government level. The procurement process has been well-structured with well-defined approval mechanisms along with the drafting of standardized Model Concession Agreement (MCA) and bidding documents such as model Request for Qualification (RFQ), and Model Request for Proposal (RFP). The standardization of the procurement process and the bidding documents has been undertaken by the Federal Government to create the necessary enabling environment in order to make it attractive for private sector participation. The state governments of India have also undertaken similar initiatives to make the development of infrastructure sectors under their jurisdiction attractive to private investors. The state governments have followed the same PPP process established by the Federal Government. Therefore, the current study has focused on the procurement process set up by Planning Commission to examine the extent to which the key activities and deliverables of the process help in promoting sustainable development. The PPP procurement process in India has been divided into four phases: project identification, project development, project tendering and contract award, and project implementation and contract management (DEA 2011). Table 2.1 shows the detail phases of PPP process with key activities involved in each phase. The four phases of PPP procurement process in India are briefly explained as below:

Phase 1: Project identification (needs assessment and options appraisal)

At this initial stage of project formation, the need for a particular infrastructure facility is identified through a strategic planning, normally carried out by the government (more often by the project executing organization). The needs assessment is usually done in the form of a cost-benefit analysis. After this, an internal assessment is done to ascertain whether the organization is having enough resources for financing that facility and whether it is affordable. The suitability of the project for development as PPP project is determined through a qualitative VfM analysis. And, as part of the pre-feasibility study, EIA is also carried out to assess the impact of the project on the environment.

Table 2.1: Phases of Indian PPP procurement process with key deliverables

Phase	Main Deliverable	Sub-deliverables
Project identification	Strategic planning	Assessment of current infrastructure situation; Identify infrastructure need
	Pre-feasibility study	Needs and optional analysis; Scoping social and environmental analysis; Financial viability
Project development	Review of plans	Team formation; Review plan and procedure preparation
	Full feasibility study and PPP due diligence study	Market analysis; Environmental & Social (E&S) feasibility (EIA and SIA); Technical feasibility; Financial and economic analysis; Risk studies; Value for money (VfM) analysis
	First draft of key documents	Expression of interest (EOI); Request for qualification (RFQ)
Project tendering and contract award	Procurement preparation	Procurement and evaluation (P&E) team formation; Review of project information; Appointment of independent monitor
	Prequalification of bidder	Identify potential bidders - EOI; Qualify the bidder - RFQ
	Final bid documents	Request for proposal (RFP); Concession agreement (CA)
	Bidding	RFP distribution and bid preparation; Bid evaluation
	Contract finalization	Contract agreement; Auditing
Project implementation & management	Contract management & monitoring	Implementation and operation of the project; Performance monitoring and contract enforcement

Phase 2: Project development

After preliminarily establishing the suitability of developing the projects on a PPP basis, the preparation for detailed analysis on the feasibility of developing the project on PPP route vis-à-vis traditional route is undertaken by the public entity. The potential PPP model that was considered suitable in the previous phase is studied in detail through a detailed feasibility study and PPP due diligence, which investigate in detail whether the project is desirable, viable and will be able to attract enough investment. PPP due diligence includes project appraisal activities such as risk analysis and allocation, financial viability, and quantitative VfM analysis. Once it has been established that the project can be developed on PPP route, the sponsor decides the procurement route and seeks in-principle approval for procurement of the project.

Phase 3: Tendering process and contract award

The goal of this phase is to select the best private sector partner for the PPP project and this phase concludes with signing of the concession agreement with the private partner. A procurement committee is set up to lead procurement and evaluation of the project proposals, and monitor the process to ensure quality and process oversight. The next step after appointment of procurement committee is to identify the potential bidders and shortlist the qualified bidders through solicitation of expression of interest (EOI) and request for qualification (RFQ) process, respectively. The shortlisted firms are then invited to participate in the RFP stage. Bid documents comprising of Request for Proposal (RFP) and draft concession agreement are shared with the shortlisted private parties. The bid proposals submitted by the shortlisted bidders are then, evaluated on the basis of pre-specified technical and financial criteria. Award and signing of concession agreement with the preferred bidder marks the completion of this phase of project procurement.

Phase 4: Project implementation and contract management

The goal of this phase is to ensure the PPP project is implemented and carried out according to the terms and conditions of the CA. The Government and the implementing agencies shall endeavor to ensure timely and smooth implementation of the project. The implementing agency will put in place a suitable contract administration framework for monitoring project performance milestones over the contract period. The appropriate mechanisms for project monitoring such as Project Monitoring Unit (PMU) and inter-department committees should be put in place to oversee project implementation, facilitate coordination between departments and render assistance during events of dispute resolution or arbitration.

2.2.4 Past research's on PPPs for infrastructure development

PPPs have been one of the research areas which have been under study since the 1990s. Ke et al. (2009); Tang et al. (2010), Liu et al. (2015), Zhang et al. (2016) and Song et al. (2016) have carried out review studies on PPPs in the context of construction industry and infrastructure projects. These reviews have summarized that the most of the studies have focused on one of the following areas: risks, relationships, project success factors, concessionaire selection, and financing. The major focus of past studies has concentrated on the themes relating to logistics and design of PPP projects such as risk management,

relationships between public and private sector, financing and economic issues, concessionaire selection and concession design, and critical success factors. Table 2.2 summarized those themes. The critical review on each theme is briefly explained as below.

Table 2.2: Various studies on PPPs in the past

Sl. No.	Study areas/themes	Reviewed by various authors					
		1	2	3	4	5	6
1.	Risk management	√	√	√	√	√	√
2.	Relationships between public and private sectors	√		√			√
3.	Financing and economic issues	√	√	√	√	√	
4.	Concessionaire selection and concession period	√	√	√	√		√
5.	Critical/project successes factors or Best practices	√	√	√	√	√	√

[Authors: 1. Ke et al. 2009; 2. Kwak 2009; 3. Tang et al. 2010; 4. Liu et al. 2015; 5. Zhang et al. 2016; 6. Song et al. 2016]

Risk management

The studies on risk management of PPP projects have shown a progression from identification of risks to formulation of appropriate model for mitigation some of the critical risks. Most of the initial studies on this theme have focused on identification of risks of PPP projects. These studies have identified the risks of PPP projects to include political risks, financial risks, revenue risks, market risks, demand risks, promoting risks, procurement risks, development risks, construction completion risks, and operating risks (Akintoye et al. 1998; Thomas et al. 2003; Zayed and Chang 2002). Categorization of these risks into certain groups have also been attempted in some of the previous studies. For instance, Shen et al. (2006) have used the case study of Hong Kong Disneyland theme park to analyze the risks affecting project performance and grouped the risks into three main factor groups: internal, project specification and external. Besides the identification and categorization of risks, another important aspect of risk management is relating to risk allocation. Risk allocation preferences in PPP construction projects in the UK have been identified through questionnaire survey by Li et al. (2005b). The author found that risks could be distinguished by whether they should be retained by the public sector or shared with the private sector. In the similar lines, Deng et al. (2008) have also summarized various principles in allocating PPP project risks, such as justice principle, liability principle, principle of risk and profit equivalence, and efficiency principle.

Country specific studies have also been carried out for risk management of PPP projects. For instance, Chan et al. (2011) conducted an empirical study and showed that the three most important risk factors of PPP projects in China are: government intervention, government corruption, and poor public decision-making processes. Specific PPP models have also been studied to mitigate some of the critical risks such as demand risk and revenue risk. Singh and Kalidindi (2006) discussed the Annuity Model for traffic revenue risk management with the help of an India case study. Annuity Model is a traffic risk-neutral PPP model where private investment by the project promoters in designing, constructing, and operating the facility is recouped with the annuities paid by the granting authority over the concession period. It could be observed from above critical review that the studies on risks have explored the various topics related to risk management include risk identification with various types and groups, principle of risk allocation, risk allocation preferences, project risk for selecting financial strategies, government's risks factors, and model for risk management.

Relationships between public and private sectors

The relationship between public and private sector entities is perceived to be crucial to the success of PPP projects as adverse relationship would easily lead to misunderstanding and conflict. Previous studies have examined what factors facilitate or inhibit the development of healthy relationship. Chan et al. (2003) conducted an industry-wide survey study and found that 'improved relationship amongst project participants' and 'improved communication amongst project participants' were the most significant benefits obtained from partnering in PPP projects. Researchers have also found that relationships in PPP projects were determined by the nature of relational contracting and relationship management (Erridge and Greer 2002; Smyth and Edkins 2007). Since a fair deal is what project parties should strive to achieve, researchers have studied the success factors of how to create win-win relationships by comparing various kinds of BOT typed infrastructure development in the United States, the United Kingdom, and China (Wang and Tiong 2000; Zhang and Kumaraswamy 2001). Their studies were intended to identify the strengths of successful approaches and provide lessons from less successful or abortive projects. Researchers have also related the relationship issue to contractor selection. For choosing suitable contractors, researchers have not only suggested benchmarking the 'best' selection practices, but have also emphasized 'innovative' contractor selection approaches

to be used by large public clients, in which relationship is always regarded as a key criterion (Palaneeswaran and Kumaraswamy 2000; Zhang 2004a). The above various studies have elaborated the various research area on relationship management between public and private sector.

Financing and economic issues

The success of a PPP project depends largely on well-planned financing. However, financing a PPP project is characterized as a difficult and complex task. This is because of the sheer number of internal and external factors that must be considered when initiating a PPP financing plan. Various studies have been undertaken that have focused on evaluation of financial viability and models for structuring the financial package of PPP projects. For instance, Ho and Liu (2002) used an option pricing-based model for evaluating the financial viability of a privatized infrastructure project and estimate when the project is at risk of bankruptcy from the perspective of project promoter and the government. Bakatjan et al. (2005) used a simplified model to determine the optimum equity level at the evaluation stage of a BOT project. This model combines a financial model and a linear programming model to maximize the return of the project from the equity holder's point of view. Similarly, model to determine the upper and lower limits of compensation funding from the government on perspective of social benefit and return on investment has been developed by Zhao and You (2013). Wibowo (2004) formulated a cash flow model to calculate operating revenues generated by a PPP project and studied the financial impact of guarantees from the perspectives of government and project sponsor. Studies on financial aspect of PPP projects have also focused on charges for infrastructure services and corresponding choice of infrastructure capacity. Subprasom and Chen (2007) have provided modeling and analysis of highway pricing and capacity choice of a BOT scheme. It was found that the combination of toll charge and roadway capacity regulation performed the best in terms of social welfare increment. Studies on financial aspect of PPP projects have also focused on modelling of bankruptcy of PPP projects. For example, Ho (2006) developed a game-theory based model to determine when and how the government would rescue a distressed project and what impacts the government's rescue behavior will have on project procurement and management. This rescue model will enable the government to develop policies and negotiate with the concessionaire.

Concessionaire selection and concession period

Concessionaire is the principal participant mainly responsible for proper implementation of a PPP project. The selection of an appropriate concessionaire could significantly influence the success of a PPP project. In view of this, various studies have been undertaken in an attempt to explain how to select the most suitable concessionaire for a PPP infrastructure project. Studies on concessionaire selection have focused on techniques for concessionaire selection and criteria for selection. Zhang (2004a) identified and compared various tender evaluation methods such as simple scoring method, NPV method, multi-attribute analysis, Kepner-Tregoe decision analysis technique, two-envelope method, NPV method plus scoring method, and binary method plus NPV method. And, the author had generalized the tender evaluation criteria into four major categories: financial, technical, health, safety, and environmental, and managerial. Application of the concessionaire selection technique has also been illustrated in some of the studies. Zhang et al. (2002) introduced the tender evaluation method, the Kepner-Tregoe decision analysis technique, and the concept of evaluation criteria for selection of concessionaires for BOT tunnel projects. Zhang (2004b) proposed a core concessionaire selection protocol that incorporates public procurement principles, best-value selection approach, competitive selection process, and multi-criteria tender evaluation. Studies on concessionaire selection have also looked into the issues private sector take into consideration while finalizing the bid. For example, Opawole and Jagboro (2016) introduced the factors influencing the scope of private party's obligations in concession-based PPP projects in Nigeria. Significant factors that influence private party's cost were found to be political interference, delay in land acquisition, variation to the contract and non-availability of supportive infrastructure.

The length of the concession period has an important bearing on the return of the project. Studies relating to concession period have focused on determining the length of the concession period. Ng et al. (2007) proposed a simulation model to assist the public partner to determine an optimal concession period. The simulation output showed that risks and uncertainties, such as a change in inflation rate, traffic flow, and operation cost, could influence the decision on the concession period. Through Monte Carlo simulation, Ye and Tiong (2003) provided a method for evaluating the mean net present value (NPV), variance, and NPV-at-risk of different concession period structures. Risk-return trade-off was studied to make sure that concession period is of sufficient duration to generate

enough financial returns commensurate with the risks assumed by them. Other studies that have focused on developing models for determining the concession period of BOT projects include studies by Shen et al. (2002) and Shen and Wu (2005). Other model was also developed to identify a specific concession period by taking into consideration the bargaining behavior of the two parties engaged into a BOT contract (Shen et al. 2007).

Critical successes factors (CSFs)

Previous studies have attempted to explore the CSFs of PPP infrastructure projects within the qualitative framework in various contextual environment. Zhang (2005) identified that main CSFs for PPP infrastructure projects could be classified into economic viability, appropriate risk allocation via reliable contractual arrangements, sound financial package, reliable concessionaire consortium with strong technical strength, and favorable investment environment. Li et al. (2005a) discovered the most important CSFs for PFI projects in UK construction industry are : strong private consortium, appropriate risk allocation, available financial market, commitment/responsibility of public/private sectors, thorough and realistic cost/benefit assessment, technical feasibility, a well-organized public agency, and good governance. Similarly, Qiao et al. (2001) have concluded the important CSFs for BOT Projects in China include appropriate project identification, table political and economic situation, attractive financial package, acceptable toll/tariff levels, and reasonable risk allocation, selection of suitable subcontractors, management control, and technology transfer. Osei-Kyei and Chan (2015) conducted a critical analysis for various studies on CSFs for PPP projects from 1990 to 2013. The author mentioned that the mostly identified CSFs are risk allocation and sharing, strong private consortium, political support, community/public support and transparent procurement. It was further noticed that Australia, the U.K., China and Hong Kong have been the countries of focus for most research studies on PPP CSFs.

Majority of the research studies has focused on design and logistics of PPP projects. However, besides design and logistics of PPPs, few research studies have also been undertaken on improving the performance of PPP such as sustainability performance measurement of PPP using key performance indicators (Zhou et al. 2013), sustainability performance-based evaluation model (Shen et al. 2016), VfM framework for improving investment sustainability of PPP power projects (Atmo and Duffield 2014), and sustainable teams' selection for PPPs (Kumaraswamy and Anvuur 2008).

It could be observed from the above critical review that studies on enhancement of sustainability of PPP procurement process is in nascent stage. The current study, therefore, tries to bring the focus on PPP procurement process from the sustainability perspective. An empirical and inclusive study has been undertaken to assess the effectiveness of infrastructure development through PPP route in promoting sustainable development, particularly in the Indian context.

2.3 Sustainable Development and Sustainability

2.3.1 Defining sustainability and sustainable development

The word ‘sustainability’ is derived from the Latin Word ‘*Sustinere*’, meaning to “hold up, endure and support” (Merriam-Webster Dictionary 2011). In 1970, the National Environmental Policy Act [42 U.S.C. 4321] described sustainability as conditions under which humans and nature ‘can exist in productive harmony and fulfill the social, economic and other requirements of present and future generations of Americans’ (Diego et al. 2012). Sustainability is an objective or a quality that is pursued. It is about celebrating our humanity, ensuring that everyone has the opportunity to fulfill their potential and enjoy a high quality of life and about equity, fairness, and justice (Parkin 2000).

The idea of sustainable development is sometimes viewed as an oxymoron because development inevitably depletes and degrades the environment (Redclift 2005). According to New Oxford American Dictionary (2014), development means “process of developing or being developed” and sustainable means “able to be maintained at a certain rate or level”. To sum it up, sustainable development implies a process of developing and maintaining whatsoever in a certain rate or level i.e. resources especially natural such that the future generation will also access the same resources that exist now. The current human activity in the name of development is threatening the availability of resources and opportunities for the generations which are yet to come.

According to the report ‘Our Common Journey: A Transition toward Sustainability’, the Board on Sustainable Development of National Research Council (1999) focused on the seemingly inherent distinction between what advocates and analysts sought to sustain and what they sought to develop, the relationship between the two, and the time horizon of the future while deliberating on the concept of sustainable development (Kates and Clark 1999). Robert et al. (2005) presented a brief outline of sustainable development in terms

of ‘what is to be sustained’ and ‘what is to be developed’ (Figure 2.2). The Board has identified that Nature, Life support systems, and Community are the three categories which is to be sustained. On the other hand, the three distinct ideas of People, Economy, and Society are the one which should be developed. Much of the early literature focused on economic development with emphasis on productive sectors providing employment, desired consumption, and wealth. In recent times, the attention has shifted to human development by giving more emphasis on values and goals, such as increased life expectancy, education, equity, and opportunity. Finally, the Board on Sustainable Development also has identified the need to develop a society that emphasize on the values of security and well-being of national states, regions, and institutions as well as the social capital of relationships and community ties (Robert et al. 2005).

What is to be Sustained	
1. Nature	Earth, Biodiversity, Ecosystem.
2. Life Supports	Ecosystem Services, Resources, Environment
3. Community	Groups, Cultures, Places
What is to be developed	
1. People	Life expectancy, Education, Equity, Equal Opportunity, Child Survival
2. Economy	Wealth, Productive Sectors, Consumption
3. Society	Institutions, Social Capital, States, Regions

Figure 2.2: Definition of sustainable development (Robert et al. 2005)

2.3.2 Evolution of sustainable development concept

At the end of World War II (1945), the United States led an effort to create a system of international agreements and institutions based on two pillars - economic development as well as social development or human rights that are predicated on a foundation of peace and security. These key elements formed the basis of the concept of development as it was formally understood by the international community. The ultimate aims of the development are human well-being, quality of life, freedom, and opportunity (NAS 2011; WCED 1987).

Development has worked well in many ways. Living standards have increased around the world, the global economy has grown, and people are living longer (UNDP 1999). Development has also caused growing problems of resource exploitation and pollution around the world. These concerns led to the creation of the Environment Committee in the

Organization for Economic Co-operation and Development (OECD 2001), which held its inaugural meeting under an American chairperson in November 1970. In 1972, in Stockholm, the United Nations Conference on the Human Environment agreed to establish the United Nations Environmental Programme (UNEP 2011). This conference did not, however, provide a framework for reconciling development with environmental protection.

In the 1970s and 1980s, however, it became increasingly clear that the interrelated issues of wide-spread poverty and growing environmental degradation around the world were not being effectively addressed and that the development model needed to be modified (NAS 2011). In 1980, the International Union for Conservation of Nature (IUCN) published its 'World Conservation Strategy: Living Resource Conservation for Sustainable Development' (IUCN 1980). The strategy represented the integration of conservation and development in the form of 'sustainable development'. It defined conservation as the 'management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations.' The IUCN acknowledged the difficulty of merging the two concepts and stated that 'Conservation and development have so seldom been combined that they often appear and are sometimes represented as being incompatible'. It nonetheless concluded that 'integration of conservation and development' is needed to 'ensure that modifications to the planet do indeed secure the survival and well-being of all people' (NAS 2011).

The World Commission on Environment and Development (known as the Brundtland Commission), adopted this approach in its seminal 1987 report, 'Our Common Future' (WCED 1987). The commission was created by a UN General Assembly Resolution in 1983 to "propose long-term environmental strategies for achieving sustainable development to the year 2000 and beyond" (UNGA 1983). The report, which described "a threatened future," provided the iconic definition of sustainable development (WCED 1987):

"Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

In 1992, United Nations organized a conference in Rio de Janeiro, which is called as United Nations Conference on Environment and Development (UNCED) or 'Earth Summit'. This conference endorsed a global sustainable development action plan, known as Agenda 21 (UNCED 1992a) and a set of 27 principles for sustainable development (UNCED 1992b). The action plan modifies the definition of sustainable development by adding a third pillar environmental protection and restoration to the economic and social pillars of development.

The idea of sustainable human well-being has become increasingly associated with the integration of economic, social and environmental spheres (Gibson et al. 2005). These integrated spheres are dimensions of sustainability known as 'intersecting circles or pillars'. These can be depicted as three overlapping circles (or ellipses), to show that they are not mutually exclusive and can be mutually reinforcing. The concept of sustainability considers not just the economic factors and environmental impacts, but also the impacts on society, the communities and people that will be affected, in both good and bad ways, by the infrastructure asset or activities associated with it. This vision of sustainability with intersecting circles/ellipses of economic, environment and social dimensions is often known as the 'Triple Bottom Line' (TBL) approach or Elkington concept (Elkington 1999). This most commonly used TBL approach to sustainable development, first given by Sadler (1988), is shown in Figure 2.3. The diagram shows three interlocking circles with the triangle of environmental (conservation), economic (growth), and social (equity) dimensions (CEE 2007).

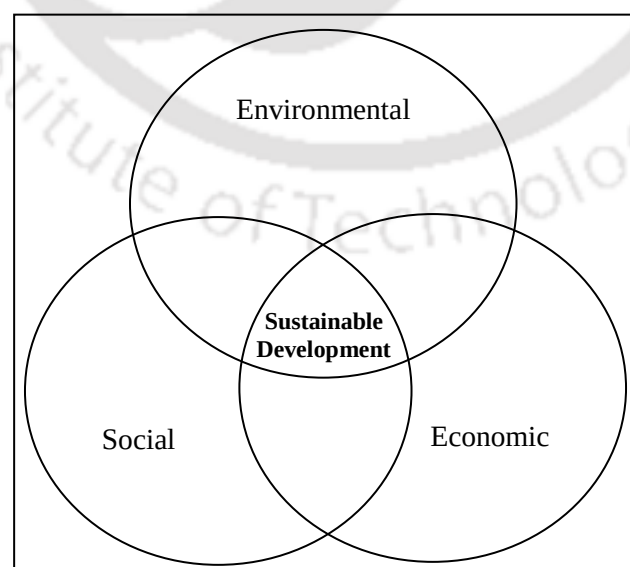


Figure 2.3: Three dimensions of sustainability (Sadler 1988)

2.3.3 Assessment of sustainability: Approaches and framework

Sustainability has become a concept which all governments and industries seemingly aspire to take by while formulating the growth strategy. However, for this concept to become a practical reality it should be possible to assess whether the development is sustainable development. Sustainability assessment is, therefore, becoming an important tool to aid the shift towards sustainability. Sustainability assessment is often described as a process by which the implications of an initiative on sustainability are evaluated, where the initiative could be either a proposed or existing policy, plan, program or a project (Pope et al. 2004). The approach of assessment by developing indicators to measure the state of the socio-economic and biophysical environment is considered to be the most common sustainability assessment method (Donnelly et al. 2007). This approach has gained momentum since it was recognized in Agenda 21 that indicators of sustainable development need to be developed to provide a solid basis for decision-making at all levels (Quarrie 1992). The Compendium of Sustainable Development Indicator Initiatives has listed over 500 sustainability indicator development initiatives being undertaken by different organizations at various levels of decision-making such as global (67 initiatives), national (103 initiatives), state or provincial (72 initiatives), and local or metropolitan (289 initiatives), in order to facilitate them to measure the extent to which various policies, programs, projects, regulations, and agreements contribute to fulfilment of sustainable development goals (Pinter and Hansen 2008).

Extensive literature also exists that focuses on the best approach for producing the complete sets of indicators for sustainable assessment. The work carried out by Bossel (1999), Meadows (1998) and Moldan et al. (1997) are some of the efforts made in this direction by addressing the criteria and methodology for constructing indicators. Bond and Morrison-Saunders (2011) have debated that sustainability assessment approaches can be broadly categorized into reductionist and holistic approaches. In a reductionist approach, the complex processes are broken down into a few component parts in the form of a few selected sustainability indicators to represent sustainability of the whole system (Bell and Morse 2008). On the other hand, a holistic approach recommends a system-based approach, as complex interactions cannot be understood in terms of sub-components (Cashmore 2004). Pope et al. (2004) have also highlighted that sustainability assessment can be categorized into two overarching approaches, triple bottom line approach, and principle-based approach. The triple bottom line approach is effectively a ‘bottom-up’

approach for sustainable assessment in which the indicators are generated by assuming that simultaneous achievement of environmental, social, and economic goals defines the state of sustainability. This approach can be considered as a reductionist approach to sustainability assessment. Most of the frameworks that have been developed for sustainability assessment of infrastructure development projects are based on the triple bottom line approach. For example, the frameworks developed by Fernandez-Sanchez and Rodriguez-Lopez (2010), Gilmour et al. (2011), Shen et al. (2011), and Ugwu and Haupt (2007) for sustainable assessment of infrastructure projects are based on triple bottom line approach. Although the triple bottom approach is a commonly adopted approach, it has been argued that the separation of the concept of sustainability into three pillars of the triple bottom line tends to lay emphasis on potentially competing interests, rather than the linkages and interdependencies between them, making the task of integration extremely difficult and promoting trade-offs at the expense of environmental degradation (Jenkins et al. 2003; Sheate et al. 2003)

Alternatively, the principle-based approach (also known as the top-up approach) begins with the specification of the state of sustainability to which society aspires in terms of sustainability principles and, then, moves on to define the sustainability criteria from the principles rather than from the triple bottom line goals. Various researchers and organizations have developed models or frameworks to assess the sustainability of infrastructure projects using the top-down approach. Most of the frameworks are based on criteria and indicators. Lopez and Sanchez (2011) have mentioned that the various assessment models developed by organizations for different types of civil engineering project. Table 2.3 summarized sustainability assessment models for various civil engineering projects. But these various frameworks have limited scope with respect to a particular type of building and infrastructure projects.

Similarly, the Indian Government has also developed GRIHA (Green Rating for Integrated Habitat Assessment) for sustainability assessment of buildings (TERI and MNRE 2010). The GRIHA framework for sustainability assessment focuses on evaluation based on a building's resource consumption, waste generation, and overall environmental impact only. The GRIHA framework, thus, gives the least consideration to the social aspects in comparison with environmental and economic counterparts. This framework suffers from the main criticisms reported in various studies, that sustainability assessment methods have focused mainly on the environmental protection of buildings (BRE 2004; Cole and Larsson

1999; Curwell et al. 1998). Furthermore, this assessment framework has poor coverage of the construction and operation related aspects and focuses more on the design aspects of the buildings.

Table 2.3: Sustainability assessment models in civil engineering projects

Sl. No.	Name of Model	Scope of model	Project Type	Source
1.	Sustainability Appraisal in Infrastructure Projects (SUSAIP)	Indicator system based on surveys of all stakeholders; sustainability managed integrally	Infrastructure, bridges	Ugwu et al. (2006)
2.	Technical Sustainability Index (TSI)	Indicators based on scientific literature, with two categories: environmental and technical	Infrastructure, power lines	Dasgupta and Tam (2005)
3.	Application of leadership in Energy and Environmental Design (LEED) system to infrastructure	Based on checklists of LEED criteria adapted from building projects; no value given for effort in each criterion	Linear infrastructure	Soderlund (2007)
4.	CEEQUAL	Assessment and awards scheme for civil engineering projects (design and construction) evaluating areas of environmental & social concerns qualitatively with checklists	All civil engineering projects	Lendrum and Feris (2008)
5.	Index of Structures' Contribution to Sustainability (ICES)	Based on Environmental Sensitivity Index with social and life cycle variables	All kinds of concrete structure	Aguado et al. (2011)
6.	Building Research Establishment Environmental Assessment Method (BREEAM)	Assessing, rating and certifying the sustainability of buildings. Applied to virtually any building and location, with versions for new buildings, existing buildings, refurbishment projects, and large developments	Office buildings	Baldwin et al. (1998)

In order to promote the use of principle-based approach, several efforts have been made to develop sets of sustainability principles. Sadler (1999), George (1999), and George (2001) have developed sustainability principles based on the fundamental principles of

sustainability as defined by the Rio Declaration and Agenda 21. Gibson et al. (2005) have developed an alternative set of eight sustainability principles and have demonstrated derivation of sustainability criteria from these principles for assessment of critical river basin infrastructure (Shah and Gibson 2013). Conceptually similar sustainability principles and criteria have been developed by Western Australia for the evaluation of the sustainability of project-level development proposals (Government of Western Australia 2003). The alternative approach, though not as common as the triple bottom line approach, is considered to be more appropriate since it avoids many of the inherent limitations of the triple-bottom-line concept of sustainability. The concept of sustainability principles, however, needs to incorporate the case and context-specific considerations while conducting the assessment (Gibson 2006).

2.3.4 Principles of sustainable development

The essential requirements for progress towards sustainability have been set out in countless different ways. A minimal set of core requirements by integrating considerations from ecological system theory, corporate greening initiatives, growth management planning, civil society advocacy, ecological economics, community development, and a host of other fields, as well as shared insights from delivery of implementation efforts has been developed into sustainability principles, which explain how to achieve sustainability of the system (Gibson et al. 2005).

In the search for sustainable policy measures, lists of sustainable principles are frequently generated. These include official versions by governments, principles adopted by organizations, and the principles proposed by individual authors. They usually consist of recommendations for specific changes that would be needed in order to achieve sustainability. The various sets of principles of sustainable development established by various governments' organizations are mentioned here. At the international level, there is the Rio Declaration on Environment and Development, announced after the United Nations Conference on Environment and Development (UNCED) meeting in Rio de Janeiro in June 1992. This document proposes 27 principles for sustainable development (UNCED 1992b). The principles of the Rio Declaration are generally recognized as the foundation of global sustainability. At the national level, a handful of countries have established sustainability principles. For example, the Australian Government has a National Strategy for Ecologically Sustainable Development (NSED), which consists of

goals, three core objectives, and a list of seven guiding principles (NAS 2011). In the United States, the President's Council on Sustainable Development (PCSD) has drafted a similar set of 15 principles that support a vision of sustainable United States of America (PCSD 1996). The UK Government has outlined a set of 10 principles that covers a substantial range of the sustainability agenda (Abidin 2005). These principles act as a guideline when developing the government's plan and strategy for improving sustainability. On the other hand, many researchers have also put forward different sets of sustainability principles as a fundamental laws or rules governing the behavior of a system. For instance, Stanners et al. (2007) have established eight key principles as goals of sustainable development at global level. Abidin (2005) has derived ten principles as a guideline of sustainability within the context of construction. Also, Gibson et al. (2005) have postulated the eight principles of sustainable development as core principles for assessment of sustainability. Among these principles, the Gibson's principles have been used worldwide as decision criteria for both assessment and framing policies to promote sustainable development. These principles have been used in the past by various researchers as core principles for sustainability assessment for urban development proposals (Morrison-Saunders and Hodgson 2009); water governance regimes (Kuzdas et al. 2014; Wiek and Larson 2012); and critical river basin infrastructures (Shah and Gibson 2013). The eight sustainability principles postulated by Gibson et al. (2005) are discussed in brief below:

- Socio-ecological system integrity – Build human-ecological relations to establish and maintain the long-term integrity of socio-biophysical systems and protect the irreplaceable life support functions upon which human as well as ecological well-being depends.
- Livelihood sufficiency and opportunity – Ensure that everyone and every community has enough for a decent life and that everyone has opportunities to seek improvements in ways that do not compromise future generations' possibilities for sufficiency and opportunity.
- Intra-generational equity – Ensure that sufficiency and effective choices for all are pursued in ways that reduce dangerous gaps in sufficiency and opportunity (and health, security, social recognition, political influence, etc.) between the rich and the poor.

- Intergenerational equity – Favor present options and actions that are most likely to preserve or enhance the opportunities and capabilities of future generations to live sustainably.
- Resource maintenance and efficiency – Provide larger base for ensuring sustainable livelihoods for all while reducing threats to the long-term integrity of socio-ecological systems by reducing extractive damage, avoiding waste and cutting overall material and energy use per unit of benefit.
- Socio-ecological civility and democratic governance – Build the capacity, motivation and habitual inclination of individuals, communities and other collective decision-making bodies to apply sustainability requirements through more open and better informed deliberations, greater attention to fostering reciprocal awareness and collective responsibility, and more integrated use of administrative, market, customary and personal decision-making practices.
- Precaution and adaptation – Respect uncertainty, avoid even poorly understood risks of serious or irreversible damage to the foundations for sustainability, plan to learn, design for the surprise, and manage for adaptation.
- Immediate and long-term integration – Apply all principles of sustainability at once, seeking mutually supportive benefits and multiple gains.

2.4 PPPs and Sustainable Development

Sustainable development is commonly defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987). This definition encapsulates the two key principles of intra-generational equity and intergenerational equity which may be regarded as necessary and sufficient conditions for sustainable development. In fact, George (1999) has argued that criteria for sustainable development can be based on these two principles alone, although there are several principles that have a role to play in the interpretation of the above definition.

Sustainable development and sustainability have become a concept which all governments, organizations and industries seemingly aspire to abide by while formulating the growth strategy. Subsequent to Rio de Janeiro Summit in June 1992, various

governments have set up programs and enacted policies to meet the objectives of sustainable development. The government of India has also enacted policies and initiated programs to implement its commitment to the principles and goals of sustainable development (MoEF 2011). These policies and programs have been designed to fulfill its commitment towards social progress, accelerated economic growth, and increased environmental conservation. One of the key initiatives undertaken by Indian Government for accelerated economic growth is the development of key infrastructure sectors such as highways, ports, power and urban infrastructure through increased private sector participation using PPP route since the economic liberalization initiated through reforming of the industrial policy in 1991 (Ministry of Finance 2014). In order to streamline the procurement of infrastructure projects through PPPs, the federal government of India has put in place a well-defined bidding process along with the model bidding documents (model RFQ and model RFP) and model concession agreement (MCA) (DEA 2011). The state governments have also undertaken similar initiatives to make the development of infrastructure sectors under their jurisdiction attractive to private investors. As a result, governments were able to attract private investment to the tune of INR 134,205 crore (US\$224 billion) through PPP up to 2012 (Planning Commission 2013a). The major portion of the private capital around INR 109,073 crore (US\$182 billion) has been invested in the development of transportation related infrastructure projects in sectors such as highways, airports, and ports. On the other hand, urban infrastructure sectors such as urban transportation, water, wastewater, and solid waste management have not been able to attract enough private investment to meet the widening demand-supply gap caused by rapid urbanization. In view of this, it will not be incorrect to say that private investment through PPP expands market forces leading to the unequal development and social marginalization. The motives of PPPs appear not to be aligned with social welfare maximization objective. However, PPPs expand market forces in infrastructure development and the greater focus on the private sector on furthering their financial interests takes precedence over other objectives associated with sustainable development. The Indian government, therefore, has focused on achieving growth in a sustainable and inclusive manner, along with the emphasis on increasing private investment in infrastructure development through the PPP route, in the current 12th Five Year Plan (Planning Commission 2011). PPPs have enabled the cash-strapped governments to build the much-needed infrastructure. Various governments have placed emphasis on infrastructure development on account of its spill-over effects such as poverty mitigation,

increased international competitiveness, and improved efficiency and these spill-over effects help in fulfilling the goals of sustainability while limited access or low-quality infrastructure has a far greater adverse impact on the poor than the rich (Fay et al. 2011). However, there exist various issues that adversely affect the fulfillment of sustainable development goals when projects are procured through PPP route. The issues are discussed in the next sub-section as below.

2.4.1 Criticism on PPPs: Perspective of sustainability

Though the PPPs have been used as the preferred procurement route for infrastructure development in developed and developing countries since last two decades, but the PPP procurement process still suffers from various criticisms when analyzed from the perspective of sustainable development. The major criticisms are relating to environmental and social aspects, and sustainability aspects.

Environmental and social aspects

PPP procurement practices have been criticized by various researchers when looked at from the perspective of social and environmental aspects of sustainable development. For instance, Hill and Collins (2004) stated, based on the examination of global legislation in PPPs, that the current bid evaluation criteria for PPPs have not considered social and environmental aspects during bid evaluation. Regeczi (2005), based on the analysis of different types of PPP infrastructure projects, has concluded that governments are yet to use PPPs to show concerted leadership on environmental and social protection practices. Samuel and Oshani (2012) mentioned that the environmental and social aspects of sustainability have not been considered in designing the PPP structure and model. CIPS (2008) pointed out that PPPs have little incentive for the private sector to promote innovative and sustainable solution to minimize environmental and social issues by using energy efficient systems in the construction and operation of the project facilities. Finally, with respect to PPPs in India, Mahalingam (2010) has emphasized that the weaknesses in the facilitating environment, improper risk allocation, and lack of transparency during bidding in Indian PPP projects could obstruct promotion of social objectives of sustainable development.

Sustainability principles aspects

PPP procurement practices have also been criticized by various researchers with looked into from the perspective of principles of sustainable development. For instance, Graham and Marvin (2001) have contended that PPP is preferable to private investors when it predominantly focused on providing ‘premium network’ connections in high-value locations, while less profitable geographical regions and project types are often overlooked. The limited access and low quality of infrastructure at low or less profitable region would affect the intra-generational and inter-generational equity principles of sustainability. Ryan (2004) has also concluded that sustainability has not been a key focus in PPPs as sustainable development principles are largely absent from the theory and frameworks that underpin and direct PPP action. Cheung (2009) pointed out the major common complaints by the general users against PPP projects is the high tariffs charged for the services provided by the private sector, which will make it inaccessible the infrastructure facility to some sections of the society. This will ultimately affect the intra-generational equity principle of sustainability. Clifton and Duffield (2006) have indicated that one of the key sustainability issues relates to the failure of the PPP system in protection of the society’s interests in terms of intra-generational and inter-generational equity. UN-HABITAT (2011) has also made a similar observation that most of the urban sector PPPs do not integrate the key principles of sustainable development into their planning and implementation process.

2.4.2 Integration of sustainability in PPP process

Various organizations are at different stages of incorporating sustainability into their business activities. Some of the organizations have looked at reducing the use of electricity in their offices, others have started to look at how sustainability can be incorporated into projects and works they undertake for clients. Some organizations have gone further and actively made it part of their organization by introducing organization’s vision, values and mission statement (Gavin et al. 2012).

In order to facilitate the adoption of sustainable principles in public procurement, studies on public procurement have suggested the need for modification of the existing procurement framework in order to promote sustainable development objectives. The key findings include suggestions on the inclusion of environmental criteria in purchasing (Brammer and Walker 2007), green criteria in tender evaluation (European Commission

2004), social inclusion in procurement policy (McCrudden 2004), and embedding green procurement principles within public procurement (Thomson and Jackson 2007). With respect to infrastructure projects, studies have been undertaken to identify areas for incorporation of sustainable procurement practices in the procurement of infrastructure projects. For instance, Lenferink et al. (2013), based on the study of Dutch Road infrastructure projects, have concluded that an integrated contract, Design-Build-Finance-Maintain (DBFM), can lead to more sustainable infrastructure development as it offers lifecycle optimization incentives by linking the contract stages of design, construction, and maintenance. Zhang and Kumaraswamy (2001) have studied the various kinds of Build/Operate/Transfer (BOT)-type procurement protocol for infrastructure projects in both developed and developing countries and have drawn lessons for an improvement of the protocol. Some of the key lessons drawn from the study include the selection of the most suitable private party, development of a workable procurement process, and improving social acceptance of the project. Kumaraswamy and Anvuur (2008) have developed a basic framework for selecting sustainable PPP team players based on assessments of their past performance against technical, sustainability, and relational criteria. Such an integrated framework will bring clarity and consistency to PPP team selection, and assist immensely in assembling the right team to prepare for procurement. Similarly, different studies have also explored the possibility of inclusion of sustainability principles or aspects in PPP procurement process to accomplish the goal of infrastructure development. Some of the studies have advocated the need for inclusion of social and environmental dimension of sustainability in PPP process. For instance, Samuel and Oshani (2011) have pointed out few of the weaknesses of PPP procurement process from sustainability perspective through analysis of six different types of infrastructure projects. The researchers have suggested that governments should embed environmental and social safeguards in their tender evaluation, supplier selection, and monitoring and contract functions of PPP practices. Also, PPPs should embed environmental and social safeguards in their goals, designs, and specifications. One of the mechanism could be in the form of conducting environmental impact assessments as part of the licensing and construction permit requirements, and towards integrating sustainability across the PPP life cycle (Samuel and Oshani 2012). Hill and Collins (2004) suggested that the social and environmental aspects of sustainable development should also be included as evaluation criteria in the bidding process.

The various researchers have suggested for inclusion of principles of sustainability in different activities of PPP process. For instance, Lockie (2003) suggested that sustainability principles could be incorporated in PSC model of VfM estimation during the development stage of PPP process. PWC (2008) mentioned that the public sector and private sector need to consider a holistic approach towards incorporation of sustainability principles in the design of the project, both in the planning and the delivery stages. Samuel and Oshani (2012) have mentioned that the principles of transparency, accountability, whole life costing, and VfM have not been prioritized in the design of PPPs. Finally, the experts who had participated in the Policy Consultation Form (UNESCAP 2007) and Expert Group Meeting (UNESCAP 2009) organized by the United Nations Economic and Social Commission for Asia and Pacific (UNESCAP) have also suggested the need to integrate the principles of sustainability in PPP procurement process for the infrastructure development.

2.5 Summary

This chapter has explored the concepts of various parameters related to present study and helped in identification of the research gaps and need for the study. It has been observed from the literature review on PPP practices worldwide that the past research on PPPs has focused on the logistic and design of PPP projects such as critical success factors; risk management; relationship between public and private sector; concessionaire selection and concession period; and financing of PPPs. Studies on enhancement of sustainability in PPP procurement process are in nascent stage. Thus, there is need to bring the focus on PPP procurement process from a sustainability perspective. The chapter further explored that the goal of sustainability could be achieved by assessing infrastructure sustainability through principle-based approach using Gibson's core principles of sustainability. These core principles of sustainability have been selected for the analysis of PPP procurement process to achieve the first objective of this study. Also, the chapter explored the criticism on PPPs from the perspective of sustainability. It has been observed from criticisms on PPPs from the sustainability perspective that the most of the studies have indicated the failure to promote intra-generational and inter-generational equity principle of sustainability. This highlights the need to improve the PPP procurement process through the incorporation of sustainable development principles in PPP procurement process. Lastly, various studies have explored inclusion of sustainability principles in public

procurement through the development of appropriate framework. One of the key conclusions that could be derived from the review of previous studies is the need to integrate the concept of sustainability principles in PPP procurement process in order to promote sustainable infrastructure development through PPP route also.



CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter explains the research methodology adopted to achieve the research aim and objectives and answer the research questions that have been raised. To make sure that the research has been undertaken in a coordinated manner, an interactive model of research design has been used to guide the flow of work. The concept of research methodology and method is briefly explained in the first section. The research methods along with the techniques selected for the study are discussed in the third section to justify their adoption for this study. In the fourth section, a brief description of the research stages and research approaches are presented in order to highlight the research process and the reason behind selection of research approach. The fifth section explains the qualitative tool (software) adopted in the study for the analysis of qualitative data. The steps of qualitative data analysis along with the various techniques that had been used to develop the grounded theory is discussed in the last section of this chapter.

3.2 Research Methodology and Method

Research is an ongoing process that contributes to a large body of knowledge (Neuman 2013). The research methodology is perceived as the overall method to satisfy the aim of the investigation (Hall and Hall 1996). The terms ‘method’ and ‘methodology’ could be seen as related concepts, but the meanings of these terms are different. Thus, the ‘methods’ of research are the actual techniques or procedures used to gather and analyze data related to some research question or hypothesis (Blaikie 1993). This includes techniques or procedures such as engaging people in conversation, getting participants to fill out questionnaires, document surveys, getting records and observing behavior. The term ‘methodology’ is defined as a particular procedure or set of procedures (Creswell 2007). The methodology does not refer to simply a set of methods, rather it refers to general philosophies of science and detailed research methods (Saunders et al. 2007). In particular, the methodology comprises of methods, the technical practices used to identify research questions, collect and analyze data and present findings, and the sets of conceptual and

philosophical assumptions that justify the use of particular methods (Payne and Payne 2004).

3.3 Research Methods Used in the Study

Creswell (2009) has indicated that there are three major approaches to conducting the research and these approaches are qualitative, quantitative, and mixed research. However, selection for a particular research approach depends on the nature of the problem (Wing et al. 1998). Fellows and Liu (2008) have stated that when research question and objective are descriptive in nature, then qualitative research is the preferred research method. The study's research question and objectives are descriptive in nature so the study has adopted qualitative research approach. Creswell (2007) mentioned that the qualitative research inquiry could be conducted through five qualitative approaches, such as narrative, phenomenological, ethnographic, case study, and grounded theory. Out of these qualitative approaches, the grounded theory approach emphasizes on the meaning of an experience for a number of individuals to generate or discover a theory (Strauss and Corbin 1998). As the main aim of the study is to formulate a framework of strategies to enhance the sustainability, therefore, the study proposes to adopt the grounded theory approach has been found to be the preferred approach for the research inquiry. Furthermore, Strauss and Corbin (1998) mentioned that the grounded theory is more appropriate for developing theory from multiple sources of data. Therefore, the present study has used two data sources such as literature and interview for qualitative research inquiry.

The research methodology that has been adopted for the study undertook the research inquiry to answer the research question through the following five research stages:

Stage 1: Analysis of PPP procurement process: Perspective of sustainability principles

Stage 2: Development of preliminary framework: Integration process

Stage 3: Development of final framework through focused interview

Stage 4: Assessment of causal behavior of framework: System dynamics approach

Stage 5: Validation of framework through survey protocol

Research inquiry through the above-mentioned five stages has used two qualitative research methods such as grounded theory and system dynamics modeling.

3.3.1 Grounded theory

Grounded theory, an inductive research approach in the field of social science, was presented initially by Glaser and Strauss (1967) in 'The Discovery of Grounded Theory'. And, they have defined grounded theory as a general methodology for developing a theory that is grounded in data systematically gathered and analysed. The techniques behind generating grounded theory is based on obtaining qualitative data, coding, and theorizing, which has its origin in sociology focusing on behaviors of the individual within some relevant social construct that would be the focus of the study (Yearworth and White 2013). The basic idea of the grounded theory approach is to read (and re-read) a textual database (such as a corpus of field notes) and discover or label variables (called categories, concepts, and properties) and their interrelationships (Glaser and Strauss 1967).

Grounded theory is a systematic yet flexible methodology, designed to assist with the development of substantive, explanatory models grounded in relevant empirical data (Hutchison et al. 2010). Strauss and Corbin (1998) have described three major components of grounded theory methodology as a collection of data (through the literature and interview), procedures for interpreting and organizing data (through coding, memo writing and diagramming), and written and verbal reports (elaborate theorizing).

The present study has preliminarily used the grounded theory approach as a deductive research approach using literature review to analyse the PPP procurement process and development of the preliminary framework in stage 1 and 2, respectively. Further, this approach has been adopted in the third stage of the study as an inductive research approach to test the applicability of preliminary framework developed through deductive approach in stage 2 using the interview data obtained through face to face interviews with experts. The three components of grounded theory approach suggested by Strauss and Corbin (1998) have been used for the present study, which are briefly discussed below:

- Data collection – The secondary data was collected through literature review of research articles such as papers, reports, thesis and online database. The articles were preliminarily selected through a keyword search using the Google Scholar search engine. The final selection of the literature was guided by two criteria proposed by Fischer and Gazzola (2006): (i) publications were selected based on whether they included international overviews of the research area; and (ii) accessibility of publications to a wide international audience. On the other hand, the primary data was

collected through face-to-face interviews with stakeholders involved in development and implementations of PPPs in India. And, semi-structured interview protocol has been followed for the data collection wherein the interview template was prepared and distributed prior to the interview meetings.

- Data analysis (interpreting and organizing data) – The qualitative data from both the sources (literature and interviews) were analyzed using the five steps of qualitative data analysis established by Miles et al. (2013) and O'Neill (2013). In the first step of qualitative data analysis, the documents (articles and interview transcripts) were uploaded and classified for further analysis. The coding procedure introduced by Strauss and Corbin (1998) was used to conduct open and axial coding with free and tree node in second step. In the third step, the coded data has been displayed through associated view or framework matrix for further analysis. Then, conclusions from the coded data were drawn in fourth step using qualitative techniques such as classical content analysis, constant comparison analysis, componential analysis and taxonomic analysis. The componential and taxonomic analyses were used in the study for the analysis of interview data. Also, the interview findings were confirmed using micro-interlocutor analysis developed by Leech and Onwuegbuzie (2008).
- Developing the theory (theorizing/ discussion) – The results from data analysis step were then corroborated with literature review findings through memo writing for development of the final framework. Hutchison et al. (2010) suggested that the concepts and categories can be better explored to develop the theory through writing of conceptual type of memos. The memos have been written for each strategy on enhancement of sustainability of PPP procurement process with respect to the various shortfalls.

3.3.2 Qualitative system dynamics modeling using CLDs

System dynamics was first introduced by Forrester (1961) as a method for modeling and analyzing the behavior of complex social systems in an industrial context (Rodrigues and Bowers 1996). It has been used widely to examine various social, economic and environmental systems, where a holistic view is important and feedback loops are critical to understanding the interrelationships (Wolstenholme 1990). The main reason for adopting system dynamics approach is because of its capacity for providing analytic solutions for both complex and nonlinear systems (Stermann 2000).

System dynamics models can be either quantitative or qualitative in nature (Park et al. 2004). Quantitative SD models analyze a given problem or system by simulating model structures, that contain quantitative values, while a qualitative model can be more appropriate when there is a high level of uncertainty and doubt about the values of the model parameters (Coyle 2000). Further, Coyle (2000) has mentioned that the qualitative data could be better managed and analyzed through causal loop diagrams (CLDs), which emphasis on identifying feedback paths that defining the interrelationship either through balancing or reinforcing feedback which can be used in a learning process. Also, Park et al. (2009) mentioned that the system dynamics is also an useful for providing systematical explanations and policy alternatives that are often counterintuitive and discerning, and for elucidating problems and identifying feedback processes with CLDs.

CLDs describe the conceptual model structure derived from a modeler's or researcher's understanding of the system and show the dynamics of variables involved in the system. Table 3.1 shows the typical denotations used in causal loop diagramming (Sterman 2000). CLDs consist of variables that are connected by arrows denoting the causal influences between variables. While developing CLDs, each causal link is assigned a polarity, either positive (+) or negative (-), to indicate how the dependent variable is impacted when the independent variable changes. These polarities are generally shown at the head of the arrow. The positive symbol, originating in the middle of a closed feedback loop, denotes that the loop acts to reinforce variable changes in the same direction as the change, and the loop is called a positive feedback loop (Reinforcing feedback loop, R). On the other hand, the negative symbol originating in the middle of a closed feedback loop denotes that the loop acts opposite to a change, and is called a negative feedback loop (Balancing feedback loop, B). Reinforcing feedback loops emphasize the impact of a study variable while balancing feedback loops reduce the impact of the study variable (Sterman 2000)

Table 3.1: Denotations for causal loop diagramming

Type of causal link (Symbol)	Denotation/Interpretation
	All else equal, if X increases (decreases), the Y increases (decreases) above (below) what it would have been.
	All else equal, if X increases (decreases), the Y decreases (increases) above (below) what it would have been.

The study has used the qualitative system dynamics modeling approach to fulfill the aim of stage 4. These models help in defining the causal relationship of various variables that had emerged from the theory developed in stage 3. The variables include shortfalls, deliverables, and strategies of PPP procurement process. The stepwise approach developed by Vennix (1996) has been followed to develop the qualitative system dynamics model using CLDs. The steps are: (1) definition of problem variables; (2) addition of causes and consequences; (3) identification of feedback loops; and (4) adding of potential solution strategies. The first three steps were used for development of preliminary system dynamics model to identify the sustainability issues in PPP process, and the fourth step relates to development of modified system dynamics model for enhancement of PPP procurement process.

3.4 Research Methodology Used in the Study

The study has adopted a five-stage research methodology to answer the research question. These research stages are shown in Figure 3.1 along with the various methods that have been used in each stage explaining how the research investigation has been undertaken to answer the research question.

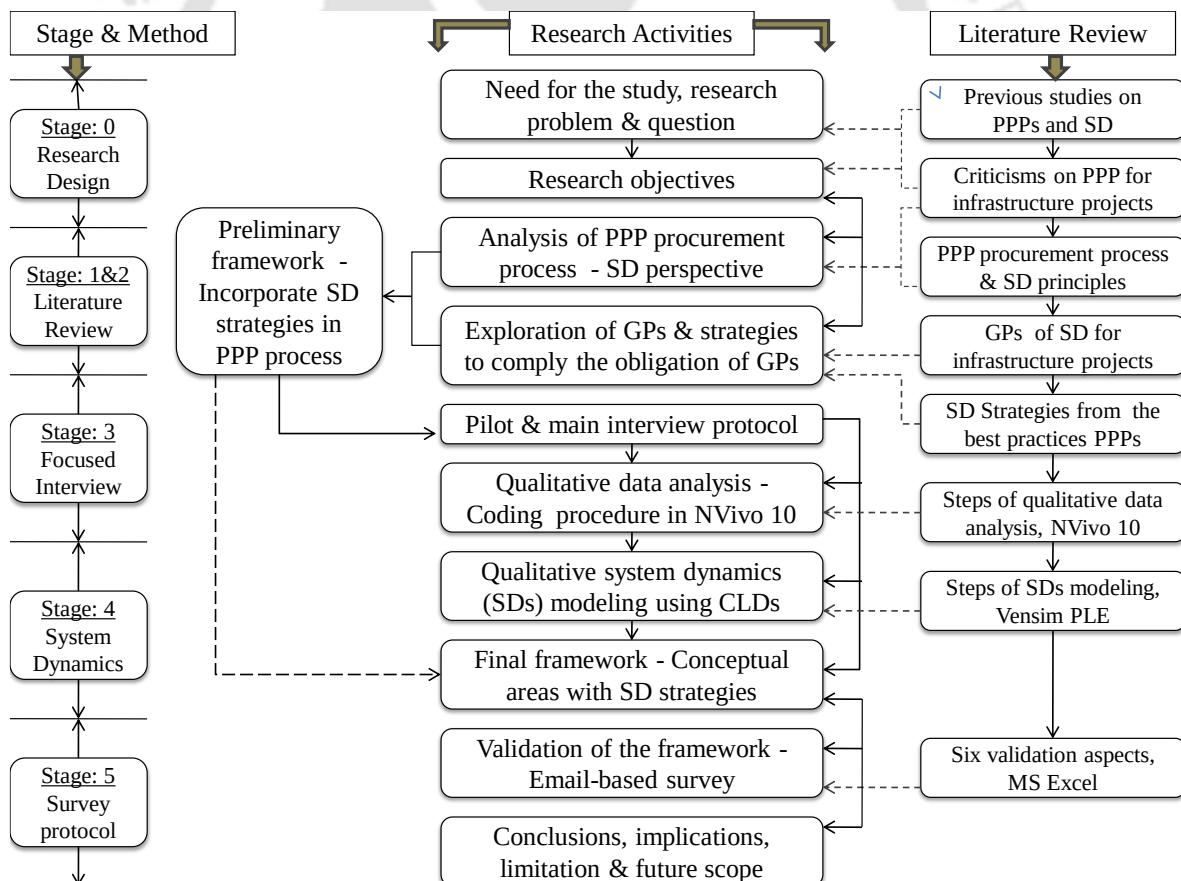
3.4.1 Analysis of PPP procurement process from sustainability perspective

The aim of this stage is to examine the Indian PPP procurement process for infrastructure project development with respect to the principles of sustainable development. In this stage, literature review through qualitative analysis of ‘textual data’ (literature on PPPs) as well as ‘documents’ (the PPP procurement process in India) was carried out to examine the PPP procurement process through the following three steps:

- In the first step a critical review of existing literature, research reports, and case studies on PPP practices was carried out to identify the key shortfalls in the PPP procurement process. A coding procedure through open coding has been conducted to identify the shortfalls. Further, the classical content analysis introduced by Leech and Onwuegbuzie (2008) has been conducted by analyzing the number of articles coded to a specific shortfall.
- In the second step, the identified shortfalls were reviewed from the perspective of the eight principles of sustainable development postulated by Gibson et al. (2005). Axial

coding has been conducted to identify the sustainability principles relating to each shortfall. Finally, constant comparison analysis was, then, carried out to classify the shortfalls based on sustainability principles which been hampered by those shortfalls.

- In the third step, using these key shortfalls, the Indian PPP procurement process has been examined to analyze the extent to which the process promotes sustainable development objectives. The main aim of the third step is to identify the key deliverables in Indian PPP procurement process that fails to promote sustainable development principles. This analysis has been conducted by writing the memos. Memos have been prepared for each deliverable of PPP procurement process that fails to meet the requirement of the sustainability principles. Findings from this stage enable identification of the deliverables in the four phases of PPP process which would be the point of intervention for sustainable development principles integration. These deliverables are the conceptual areas for the intervention.



[Acronyms in Figure: SD – Sustainable development; SDs – System dynamics; GPs – Guiding principles]

Figure 3.1: Research stages with activities

3.4.2 Development of preliminary framework

The main aim of this stage is to conceptualize the preliminary framework explaining how PPP procurement process could be improved on sustainability aspect. Robert (2000) has proposed a four levels hierarchical framework comprising of principles and criteria for assessment of sustainability and measures to achieve the sustainability goals. The four levels are three dimensions of sustainability, core principles of sustainability, guiding principles of sustainability, and strategies to comply the prerequisites of guiding principles (please refer Table 3.2).

Table 3.2: Four level of hierarchy for principle based sustainability approach

Level	Description
Level 1	Three dimensions of sustainability: Social, Economic, & Environmental
Level 2	Core principles of sustainability: Gibson's eight principles of sustainability
Level 3	Guiding principles: Eighteen guiding principles
Level 4	Strategies to comply with the prerequisite of GPs

This stage has focused on identification of the guiding principles for accomplishing the core principles and formulation of strategies to fulfill the guiding principles. Then, the preliminary framework for enhancement of PPP procurement process from sustainability perspective has been developed by mapping the relevant strategies with the shortfalls such that integration of the strategies will overcome the limitations of the procurement process in that particular aspect of sustainability. This process of development of preliminary framework has been done through the following three steps:

- In step one, a critical review of research articles, reports, and online data-base on principle based sustainability practices for infrastructure development were carried out to identify the guiding principles that will help in accomplishment of the goals of sustainability defined in the form of the core principles. A two cycle of coding procedure was adopted for identifying the guiding principles. In the first cycle, guiding principles were coded as a free node through open coding, and in the second cycle, core principles were coded as tree node through axial coding. Then, the constant comparison analysis was carried out to classify the guiding principles based on the core principles of sustainability. Further, the classical content analysis was conducted by analyzing the number of articles coded to each guiding principle.

- In step two, a comprehensive review of research article, case study reports, and online data-base on best practices being adopted in implementation of PPPs all over the world was conducted to identify the strategies to accomplish the goal of guiding principles. A two cycle coding procedure was also adopted in this step wherein in first cycle, strategies were coded as a free node through open coding, and in the second cycle, guiding principles were coded as tree node through axial coding. Then, constant comparison analysis was carried out to classify the strategies with respect to the guiding principles being fulfilled by the strategies.
- In the third step, a preliminary framework has been developed by mapping the strategies with the conceptual areas. The conceptual areas identified from the first stage of this study have been used as the intervention points of inclusion of respective strategies.

3.4.3 Development of final framework using grounded theory approach

The feasibility of this preliminary framework formulated in the previous stage has been tested in this stage through interviews. The grounded theory research approach has been used to corroborate the framework that has been previously developed through literature review with insights from experts through face-to-face interviews. The process of conducting face-to-face interviews can be considered to comprise of the following three sub-stages:

Respondent selection

The targeted respondents for the interview were selected from the stakeholders involved in development and implementation of PPP projects in India. They have been categorized into four groups, namely, transaction advisors (TAs), officials from government sectors (GSs), officials from financial institutions (FIs), and project managers from private sectors (PSs). The respondents/experts were selected based on the criteria introduced by Hallowell and Gambatese (2010) and those criteria are Educational qualification, Position in the organizational hierarchy of the firm, and Number of years of experience relating to PPP infrastructure projects in India.

Interview protocol

The semi-structured interview protocol has been designed to gain respondents' understandings about the shortfalls in PPP process and feasibility of overcoming those shortfalls with the strategies identified from literature review. As part of the interview protocol, prior contact was established with the respondents and the interview template, which were prepared to ensure that line of inquiry focuses on the strategies to overcome the shortfalls, was also shared with them prior to the interview. Interview template comprises of three major sections seeking demographic information of respondents, and their opinion on appropriateness of sustainability principles, and feasibility of the strategies to overcome the shortfalls. In order to assess comprehensiveness of draft interview template, a pilot study through face-to-face interview was conducted with six experts involved in the development of PPP projects in Guwahati region. The main aim of the pilot study was to examine clarity of language, appropriateness and logic of questions, layout, the degree of depth, ease of navigation, and user-friendliness of the whole template. The final face-to-face interviews were conducted with respondents from the rest of India.

Sample size in qualitative research projects is determined using the concept of saturation (Miles and Huberman 1994; Patton 2002). Saturation occurs when new interviews do not provide additional data over previously conducted interviews and can be limited to 5 and 50 interviews, depending on the interview content and research focus (Patton 2002). Guest et al. (2006) suggested that over 90% of findings can be recognized with as little as 12 interviews. Saturation has determined in the study by examining the later interviews for consistency in findings with previous interviews and saturation was considered to take place when no new data are found. In this study, the sample size of the interview has based on the same concept of saturation.

Analysis of interview transcriptions

The interview data has been analyzed to construct grounded theory through the coding procedure using open and axial coding. The five steps of qualitative data analysis developed by Miles et al. (2013) and O'Neill (2013) were used for the analysis. The steps include uploading and classification of documents, data condensation through coding, drawing of the conclusions and confirming the findings, and developing a theory. In step one, all the transcripts from the interviews were uploaded in the qualitative analysis software for classification and further analysis. In second step of coding procedure, the

strategies were coded in free nodes with open coding and shortfalls were coded in tree nodes with axial coding. Furthermore, an additional coding using selective coding was conducted to identify the key deliverables of PPP procurement process. Similarly, guiding principles were coded in free nodes with open coding and core principles were coded in tree nodes with axial coding. In the third step for drawings of the conclusions, a classical content analysis, constant comparison analysis, componential analysis and memo writing have been used as qualitative techniques for drawing conclusions from interview data. Classical content analysis has conducted to count a number of respondents coded for the shortfalls and the strategies. Further, a constant comparison analysis has been conducted to classify or organize the strategies (coded with open code) with the respective of shortfalls (coded with axial code), and further organize the all the shortfalls (coded with axial code) with respective of key deliverables (coded with selective code) of PPP procurement process. Then, the final framework was then formulated after organization of all the strategies with their respective shortfalls and key deliverables of PPP process. Also, the componential analysis introduced by Leech and Onwuegbuzie (2007) has conducted to test the coding similarly by each respondent group for guiding principles, shortfalls, and strategies through matrix querying. Finally, the preliminary evidence through interview were corroborated with literature review findings (from stage 1 and 2) through memos writing. The memos for guiding principles, shortfalls and strategies have been prepared to develop the grounded theory.

In the last step of qualitative data analysis, the confirmation of the findings has been carried out using micro-interlocutor analysis developed by Onwuegbuzie et al. (2009). This analysis confirms the findings by displaying the respondents' consensus in the form of a matrix using a rating scale for each guiding principles, shortfall, and strategies. A five-point scale (1 for strongly disagree, 2 for disagreeing, 3 for neutral, 4 for agree, and 5 for strongly agreed) was used to score the eighteen respondents' view on each guiding principles, shortfall, and strategies.

3.4.4 Assessment of causal behavior of framework

The main aim of this stage is to assess the causal relationships between the various variables of the final framework using system dynamics modeling. The variables include key deliverables, conceptual areas and new strategies of PPP procurement process. To assess the causal relationships, the study has adopted qualitative system dynamics using

CLDs as the research approach. Vensim PLE software package has been used for the modelling purpose. In this study, system dynamics model using CLDs have been constructed using three steps introduced by Vennix (1996). The steps are: (i) define the various variable (key deliverables, sub-deliverables/conceptual areas, and strategies), (ii) define the causal relationship between variable with causal link (+ or -), and (iii) define the system behavior of various variables for a single problem/shortfall or its solution through developing the feedback loops (balancing or reinforcing). The system dynamics models were developed through a three-stage modelling process in the study:

- Conceptual model – A conceptual system dynamics model has been developed initially to represent the key deliverables of the Indian PPP procurement process.
- Preliminary model – The preliminary system dynamics model was then developed based on the conceptual model highlighting the various sustainability issues associated with the deliverables of the PPP procurement process. These issues were obtained from stage 1 of the study research methodology.
- Modified model – The various strategies obtained from literature review and interviews were then integrated into the preliminary model depicting how the sustainability of PPP procurement process could be enhanced.

3.4.5 Validation of framework

Validation is an important process to ensure the quality of the research outcomes. This is normally undertaken as the final stage of the research works. In order to validate the framework, online survey was conducted. The validation process is based on the process adopted by Yeung (2007). Yeung (2007) has used six aspects to validate the 'Partnering Performance Index' model. And, these aspects are appropriateness, objectivity, replicability, practicability, reliability and suitability. In the similar lines, validation of the framework has been undertaken by asking the respondents to rate the extent of satisfaction of the validation aspects based on a scale of 1 to 5, where 1 corresponds to 'poor' and 5 represents 'excellent'. The data from the survey were then analyzed using statistical analysis to compute the descriptive statistics such as mean, median, and mode values of respondents' ratings on each validation aspect.

3.5 Qualitative Data Analysis Software

Hutchison et al. (2010) mentioned that many grounded theory studies failed to carry out qualitative data analysis (QDA) efficiently. Charmaz (2003) argued that the tendency is to construct conceptual analysis instead of building substantive theories and this results in creation of a descriptive account that fails to demonstrate interrelations between concepts and create a theory from which hypotheses can be generated. Many researchers, though, adopt techniques commonly associated with grounded theory (i.e. coding and memo-making) but they fail to engage in processes such as in-depth analysis of categories (Charmaz 2003) and/or the iterative process of concurrent data collection and analysis (Hutchison et al. 2010). In order to undertake QDA efficiently in the development of grounded theory, various researchers suggested using computer assisted qualitative data analysis software (CAQDAS) tool (Bringer et al. 2006; Hutchison et al. 2010; Jones 2007; Leech and Onwuegbuzie 2007). Hutchison et al. (2010) suggested that CAQDAS has the potential to turn qualitative research into a rigid automated process that supplement the role of human interpretation and reflection. Similarly, Leech and Onwuegbuzie (2007) mentioned that the CAQDAS programs provide an excellent tool for recording, storing, indexing, and sorting the voluminous data that are the hallmark of many qualitative research studies.

Various CAQDAS programs are in use for qualitative data analysis such as NU*DIST, ATLAS, XSIGHT, Web QDA, Ethnograph, and NVivo (Ishak and Bakar 2012). Amongst them, various studies have reported widespread use of NVivo for qualitative analysis. Bringer et al. (2006) have mentioned that CAQDAS programs can be used successfully to facilitate a grounded theory investigation and further explained that the software package NVivo helped the analysis move beyond thick description of the studied phenomena to an explanatory model grounded in the data. NVivo package can also facilitate many aspects of the iterative process associated with grounded theory and can help in providing a transparent account of this, which should ultimately enhance the study validity (Hutchison et al. 2010). NVivo also has the feature to search patterns of words, coding, or attributes, thereby allowing the researcher to undertake in-domain analysis, taxonomic analysis, and componential analysis (Leech and Onwuegbuzie 2007). Thus, NVivo has been selected for the development of the grounded theory of final framework.

3.6 Qualitative Data Analysis Steps Used in the Study

In this study, the qualitative data from literature review (stage 1 and 2) and focused interview (stage 3) were analyzed in NVivo for the development of grounded theory. QDA for development of grounded theory has been carried out through different chronological steps by numerous researchers. For instance, Hutchison et al. (2010) described the methodology of QDA through NVivo to include the steps such as creating the memo, incorporating the literature, managing data documents, early concept identification, and conceptual and theoretical development. Bringer et al. (2006) adopted grounded theory techniques through open coding, writing memos, axial coding, and creating models in NVivo. Ishak and Bakar (2012) have elaborated the QDA using NVivo in five basic steps: developing a document for in-depth and focus group interviews, managing documents using folders, mapping of variables through nodes, data queries using matrix coding, and developing coding reliability using coder comparison and Kappa value. Recently, O'Neill (2013) established the four steps of QDA in NVivo: (i) Descriptive: entering data sources into NVivo, (ii) Topic: organizing and coding your data, (iii) Analytic: analyzing and querying your data, and (iv) Conclusion: drawing answers from your data. On the other hand, for qualitative data analysis the standard steps suggested by Miles et al. (2013) are data condensation, displaying the data and drawing and verifying conclusion. Table 3.3 shows the similarity between the concepts used in The standard qualitative data analysis method suggested by Miles et al. (2013) has been compared with the analysis steps suggested by Ishak and Bakar (2012) and O'Neill (2013). The comparison is shown in Table 3.3 highlighting the similarities between the two approaches.

Table 3.3: Steps of QDA in NVivo by various researchers

Miles et al. (2013)	O'Neill (2013)	Ishak and Bakar (2012)
----	1. Descriptive: Entering data sources into NVivo	1. Developing document for in-depth and focus group interviews
		2. Managing documents using folders
1. Data condensation: Coding	2. Topic: Organizing and coding the data	3. Mapping of variables through nodes
2. Displaying the data: Matrix display	----	----
3. Drawing and verifying conclusion	3. Analytic: Analyzing and querying the data	4. Data queries using matrix coding
	4. Conclusion: Drawing answers from the data.	5. Developing coding reliability using coder comparison and Kappa value

The present study has used the five steps of QDA for literature review and focused interview data with the combination of standard three steps developed by Miles et al. (2013) and four steps established by O'Neill (2013). The five steps of QDA has included two steps of 'displaying the data' from Miles et al. (2013) and 'descriptive: entering data sources into NVivo' from O'Neill (2013). While, the rest of three stages are same as that suggested by Miles et al. (2013) and O'Neill (2013). These five stages of QDA using NVivo are shown in Table 3.4. These stages are also discussed in brief in the following sub-sections.

Table 3.4: Steps of QDA with tools and techniques

Sl. No.	Steps of analysis	Tools and Techniques	References
1.	Importing and classification of the documents		
a.	Uploading of documents/transcripts	Source folder: Internal sub-folder, External sub-folder	O'Neill (2013) and QSR International (2014)
b.	Classification of the documents	Attributes, values, and classifications	O'Neill (2013) and QSR International (2014)
2.	Data condensation: Coding	Open coding: Free node, Axial coding: Tree node, Selective coding: Tree node	Strauss and Corbin (1998); Leech and Onwuegbuzie (2011)
3.	Displaying of the data	Framework matrices or Associated view of node	QSR International (2014); Bazeley (2009); O'Neill (2013)
4.	Drawing and verifying of conclusions		
a.	Drawing of conclusions	Constant comparison, Classical content, Domain, Taxonomic, Componential, Keywords-in-context, and Word count analysis	Leech and Onwuegbuzie (2007); Leech and Onwuegbuzie (2008); Leech and Onwuegbuzie (2011)
b.	Confirming / Testing of finding	Micro-interlocutor analysis (for interview data only)	Onwuegbuzie et al. (2009)
5.	Developing a theory	Memos: Memo witting	Hutchison et al. (2010); O'Neill (2013)

3.6.1 Importing and classification of the documents

In this preliminary step, all the documents from the literature review or interview sources are uploaded into the source folder of NVivo for further analysis. The source folder is divided into the three sub-sections/sub-folders of internals, memos, and externals for

classification of the documents (O'Neill 2013). Internal sub-folder includes a combination of documents, PDFs, audio, video, pictures or data sets. The research materials like books or manuscripts that cannot be imported into NVivo are created as an external source where the content of the item is summarized. The current study used an only internal source to upload the literature review and interview documents like PDFs and word files for the analysis. Further, it creates various additional folders in internal sun-folder to classify the documents in various categories. Also, the demographic study of respondents for an interview has been conducted to validate the criteria for respondent's selection such as age, gender, experience, and education. These criteria would then be classified through attributes value in NVivo (QSR International 2014). These above mentioned techniques in NVivo were used in this study for the uploading and classification of documents from literature and interviews.

3.6.2 Data condensation: Coding

The qualitative data obtained from any source is reduced and organized through coding, writing summaries, and discarding the irrelevant data in this stage. The best way to condense the data is using the coding procedure. The open, axial, and selective coding are the three types of coding established by Strauss and Corbin (1998) for coding of the first, second, and third cycles for condensation of data, respectively. The open and axial coding are normally conducted at free and tree node, respectively in NVivo (Leech and Onwuegbuzie 2011). Further, selective coding with axial coding is conducted at second tree node in NVivo. Open coding is the part of the analysis dealing with identifying, naming, categorizing and describing phenomena found in the text. Axial coding is the process of relating codes (categories and properties) to each other via a combination of inductive and deductive thinking. Selective coding is the process of choosing one category to be the core category, and relating all other categories to that category (Strauss and Corbin 1998). The same coding procedure has used in this study for coding of literature and interview data.

3.6.3 Displaying the data

Data display goes a step beyond data condensation to provide an organized, compressed assembly of information that permits drawing of conclusions from the data. A display can be an extended piece of text or a diagram, chart, or matrix that provides a new way of

arranging and thinking about the textually embedded data. Data displays, whether in word or diagrammatic form, allow the analyst to extrapolate from the data and start to discern systematic patterns and interrelationships. At the display stage, additional, higher order categories or themes may emerge from the data that go beyond those first discovered during the initial process of data condensation (Miles et al. 2013).

To draw conclusions from the mass of data, Miles and Huberman (1994) suggested that a good display of data in the form of tables, charts, networks and other graphical formats is essential to analysis the data systematically for drawing conclusions from the mass of data. The 'framework matrix' and 'associated view of node' is the best tool to display the qualitative data in NVivo (O'Neill 2013; QSR International 2014). The framework matrix displays the data in the matrix with authors of article/interview respondents in a row and free or tree node/issues in the column. While in associated view, the node displays the data directly, which shows the view of data coded in respective free/tree node with the name of author/respondent. In this study, the associated views of a node and framework matrix were used for display the coded data from literature and interview data, respectively, in NVivo.

3.6.4 Drawing and verifying of conclusions

This stage allows beginning and developing conclusions regarding the qualitative study. There are various tools and techniques in NVivo for drawing and verifying conclusions from any source of qualitative data. The QDA tools like a constant comparison, classical content, domain, taxonomic, componential, keywords-in-context, and word count analysis are the better option to generate meaning and drawing conclusions from any type of the data (Leech and Onwuegbuzie 2008). In this study, constant comparison, classical content, taxonomic, componential analyses were used for the analysis of coded data from both the sources. The constant comparison analysis is used to identify the underlying themes. In this study, the themes from the coded data (free nodes) were identified to generate tree nodes or axial codes through constant comparison analysis. While and classical content analysis is used to count the number of sources (articles or respondents) coded the data in each free node. The taxonomic analysis is used to define the relationships between the variable through developing of models in NVivo; while componential analysis is used to test/check the coding similarity amongst the various groups of experts through matrix query in NVivo. The taxonomic and componential analyses were used for drawing

conclusions from only interview data in this study. In addition to these analyses, the micro-interlocutor analysis technique introduced by Onwuegbuzie et al. (2009) had been used in this study for testing/confirming of findings from the interview data. Micro-interlocutor analysis has been used to confirm the findings through displaying of respondents' consensus in the form of a matrix using a rating scale for each variable (i.e. shortfalls and strategies) in this study.

3.6.5 Developing a theory

Interpretation of the data for development of the grounded theory is the final step in the qualitative data analysis after completion of coding and analysis of qualitative data. The qualitative technique of memo writing has been suggested to be one of the best options to interpret the coded and classified data for generating meaningful new theory (Hutchison et al. 2010). The present study used the same concept of memo writing to develop the deductive theory from literature review data through developing conceptual memos in NVivo. Further, the inductive grounded theory has been developed from interview data and corroborated with literature review data through writing of final memos in NVivo.

3.7 Summary

The study had decided to adopt the qualitative research strategy as the research question was a 'how' research question. This chapter, thus, describes the research methodology along with research approach, research methods, research stages and activities, types of data sources, computer assisted tools and techniques for qualitative data analysis adopted in this study. Multiple research methods such as grounded theory and qualitative system dynamics modeling through CLDs had been used in this study as part of the qualitative research approach. The two sources of data such as the literature review and focused interview have been used for the qualitative research inquiry. The qualitative research inquiry to develop the grounded theory of the proposed framework has been conducted through five research stages: (i) Analysis of PPP procurement process from the perspective of sustainability principles, (ii) Development of preliminary framework, (iii) Development of final framework through focused interview, (iv) Assessment of causal behavior of framework using System dynamics approach, and (v) Validation of framework through survey protocol. These five steps of qualitative data analysis have been opted as the preferred approach for development of grounded theory of final framework of

deliverables, conceptual areas and strategies of PPP process. Computer assisted qualitative data analysis software package NVivo10 has been opted for qualitative data analysis of literature and interview data. Further, the qualitative system dynamics modeling using CLDs have been adopted for defining the inter-relationship and causal behavior amongst the three variables (deliverables, conceptual areas/shortfalls, and strategies) of final framework. Finally, the final framework has been validated using survey technique.





CHAPTER 4

ANALYSIS OF PPP PROCUREMENT PROCESS: SUSTAINABILITY PERSPECTIVE

4.1 Introduction

This chapter presents the first research stage of the study wherein the PPP procurement process being used in India for development of infrastructure projects has been examined from the perspective of sustainable development. For the analysis, a framework derived from the principles of sustainable development has been used to assess the associated processes and practices of current PPP procurement processes in order to identify the shortfalls that hamper the achievement of sustainability goals. In this stage, the study has used deductive grounded theory research approach through literature review for the research inquiry. The qualitative data which had emerged from the literature review was, then, analyzed through coding procedure in NVivo10. A brief description about the method used for data collection and analysis is explained in the second section. Finally, the findings from the qualitative data analysis are discussed in the final section of this chapter.

4.2 Data Collection and Analysis

A critical review of literature, research reports, and case studies on PPP practices across the world was carried out to identify the key shortfalls in the PPP process. The articles were analyzed through a keyword search in the Google Scholar search engine. The keywords used for the search include PPP, procurement protocol, environmental protection, social inclusion, and economic impact. The final selection of the literature was guided by two criteria: (i) publications were selected based on whether they included international overviews of the PPP process, methodology, and case studies; and (ii) accessibility of publications to a wide international audience. A total of 48 articles were reviewed from secondary data sources to identify the shortfalls in PPPs. The classification of the articles is shown in Figure 4.1.

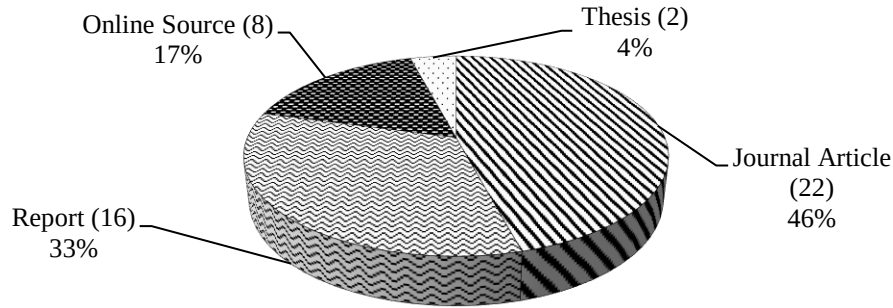


Figure 4.1: Pie chart of secondary data source

All the 48 documents were uploaded in NVivo10 for the qualitative data analysis. The qualitative data was, then, analyzed using NVivo 10 according to the five steps of qualitative data analysis. In the first cycle of coding, each document was reviewed to identify the shortfalls in PPPs and these shortfalls were coded through open coding as a free node in NVivo10. The coding process resulted in identification of 11 shortfalls in PPPs. Table 4.1 shows these 11 shortfalls along with the sources for which each shortfall has been coded. After identification of the shortfalls, classical content analysis was carried out to count the number of articles coded under each shortfall. The last row of Table 4.1 shows the result of the classical content analysis. It has been observed from classical content analysis that the shortfall 'high bidding and transaction cost' coded highest number of sources (i.e. 24 times), while the shortfall 'inadequate environmental impact assessment' coded the lowest number of sources (i.e. 6 times).

Table 4.1: Shortfalls in PPPs for infrastructure development

Type of Source	Source Code	Sources/Authors	Shortfalls in PPPs										
			1	2	3	4	5	6	7	8	9	10	11
Journal Articles	J1	Arts and Faith-Ell (2012)	√					√					
	J2	Arce and Gullon (2000)	√	√									
	J3	Li et al. (2005b)						√	√	√	√	√	
	J4	Carrillo et al. (2008)			√	√					√		
	J5	Chan et al. (2010)		√					√	√	√	√	
	J6	Cheung and Chan (2011)				√			√	√		√	
	J7	Grimsey and Lewis (2005)			√							√	

Contd.

Table 4.1 (Contd.)

Type of Source	Source Code	Sources/Authors	Shortfalls in PPPs										
			1	2	3	4	5	6	7	8	9	10	11
Journal Articles	J8	Taseska (2008)						√			√	√	
	J9	Kwak et al. (2009)		√					√		√	√	
	J10	Koppenjan & Enserink (2009)				√	√	√	√			√	
	J11	Kumaraswamy & Zhang (2001)		√						√			
	J12	Tang et al. (2010)		√									√
	J13	De Clerck et al. (2012)								√	√		
	J14	Curnow et al. (2005)			√	√		√		√	√		
	J15	Mahalingam (2010)	√							√	√	√	
	J16	Tiwari and Ashish (2013)		√	√				√			√	
	J17	Lakshmanan (2008)								√		√	√
	J18	Devkar et al. (2013)				√						√	
	J19	Telang & Kutumbale (2014)			√					√		√	
	J20	Harris (2004)					√				√		
	J21	Engel et al. (2011)					√	√	√				
	J22	Rashed et al. (2011)							√	√	√	√	
Research Reports	R1	Hill and Collins (2004)			√	√		√		√			
	R2	Thomson et al. (2005)				√					√		
	R3	Bain (2009)			√			√					
	R4	Samuel and Oshani (2012)			√	√	√	√			√	√	√
	R5	Samuel and Oshani (2011)			√		√	√			√	√	
	R6	Dwivedi (2010)		√		√			√				
	R7	Nataraj (2014)				√							√
	R8	KPMG (2010)				√	√	√			√		
	R9	Deloitte Research (2006)			√					√	√		
	R10	PWC (2005)			√	√		√			√		
	R11	OECD (2011)						√			√		
	R12	WEF (2013)			√	√	√			√	√		
	R13	UN-HABITAT (2011)									√	√	√
	R14	UNESCAP (2007)	√			√	√	√					
	R15	DEA (2006)		√						√		√	
	R16	DEA (2010b)		√		√		√	√				

Contd.

Table 4.1 (Contd.)

Type of Source	Source Code	Sources/Authors	Shortfalls in PPPs										
			1	2	3	4	5	6	7	8	9	10	11
Online Sources	O1	Lorenzo (2008)	√			√		√					
	O2	Thakur (2013)					√			√			
	O3	Brad (2011)			√		√				√		
	O4	CIPS (2008)					√	√					
	O5	IDFC (2012)							√	√			
	O6	DTF (2007)			√					√	√		
	O7	EPSU (2011)			√						√		
	O8	Hamilton & Holcomb (2012)				√					√		√
Theses	T1	Cheung (2009)		√				√	√		√	√	
	T2	Gupta (2011)	√	√	√		√		√				√
Total number of sources coded for each shortfall			06	11	16	17	12	18	13	17	24	18	07

[Acronyms for shortfalls: 1. Inadequate environmental impact assessment, 2. Lack of stakeholder's participation, 3. Inadequate VFM analysis, 4. Lack of skill and knowledge of sustainability concepts in actors, 5. Lack of incentives to private sector, 6. Inadequate bid preparation and evaluation, 7. High user charges for infrastructure services, 8. Inadequate risk allocation and mitigation, 9. High bidding and transaction cost, 10. Lack of transparency & accountability during bidding, and 11. Goal conflicts between public & private sector]

Further, the shortfalls were reviewed from the perspective of the sustainability development principles postulated by Gibson et al. (2005) and, then, these principles were used in labeling the themes. The themes, which have been labeled with a descriptive title highlighting the sustainable development principles that have not been fulfilled, were coded through axial coding as a tree node in NVivo10. Table 4.2 shows the various shortfalls along with the themes under which the shortfalls have been grouped. The themes derived from the analysis include: (i) Inefficient resource utilization and failure to promote socio-ecological system integrity, (ii) Intra-generational inequity and lack of livelihood sufficiency and opportunity, (iii) Failure to promote socio-ecological civility and demographic governance, and (iv) Inadequate precaution and adoption measures. Finally, using these key shortfalls, the Indian PPP procurement process had been examined to analyze the extent to which the process promotes sustainable development objectives in the last stage of the analysis.

Table 4.2: Results of QDA for literature review on shortfalls in PPPs

Sl. No.	Failed sustainability principles (Tree node/axial coding)	Shortfalls in PPP process (Free node/open coding)	Nos. of articles coded
1.	Inefficient resource utilization and failure to promote socio-ecological system integrity	Lack of incentives to private sector	12
		Inadequate value for money analysis	16
		Inadequate environmental impact assessment	06
		Inadequate bid evaluation criteria	18
2.	Intra-generational inequity and lack of livelihood sufficiency & opportunity	High user charges for services	13
		High bidding and transaction cost	24
3.	Failure to promote socio-ecological civility and demographic governance	Lack of skill & knowledge about sustainability concept	17
		Goal conflicts between public & private sector	07
		Lack of transparency and accountability during bidding	18
		Lack of stakeholders participation	11
4.	Inadequate precaution and adoption measures	Inadequate risk allocation and mitigation	17

4.3 Results and Discussion

The shortfalls that have emerged from the analysis of PPP procurement process relating to the aspects of PPP procurement which need to be improved to ensure promotion of sustainable development goals are grouped under four themes, namely: (i) Inefficient resource utilization and failure to promote socio-ecological system integrity, (ii) Intra-generational inequity and lack of livelihood sufficiency and opportunity, (iii) Failure to promote socio-ecological civility and demographic governance, and (iv) Inadequate precaution and adoption measures. These themes are discussed in detail in the following sub-sections.

4.3.1 Inefficient resource utilization & failure to promote socio-ecological integrity

The infrastructure developed through PPP will contribute to sustainable development if the built facility does not cause harm to the complex socio-biophysical system and maintains the long-term integrity between society and the surrounding environment. In

addition to maintaining the socio-ecological integrity, the facility should also promote the principle of optimal resource utilization through an adoption of appropriate measures to limit threats to socio-ecological systems. Barton (2013) suggested that the PPP projects with well-designed incentives and penalties systems can drive continuous improvement and influence how the private sector uses the resources and funding to create capacity in public infrastructure development for the future. There are various incentives provided to the private sector, mostly in the form of financial support initiatives. A few key initiatives include the India Infrastructure Project Development Fund (IIPDF), Viability Gap Funding (VGF), resources for annuities/availability-based payments, long tenor lending, re-financing facility, and infrastructure debt funds (DEA 2011). However, it is often observed that in PPP projects the right set of incentives is not provided to the private sector to invest, innovate, and provide optimum solutions that will promote sustainable development while structuring the PPP model (Samuel and Oshani 2011; Samuel and Oshani 2012). For instance, there is little incentive for the private sector to use energy-efficient systems in construction and operation of the project facilities (CIPS 2008). Lack of appropriate incentives to the private sector for efficient use of resources and reduction of negative environmental and health impacts may hamper progress towards sustainable development (Koppenjan and Enserink 2009). The failure to include such incentives will forgo the opportunity to ensure fulfillment of the sustainability principle on resource maintenance and efficiency and increases the threats to the long-term integrity of socio-ecological systems.

The public-sector decision to proceed with the PPP option is normally made based on value for money (VfM) analysis. VfM is a measure of how much it would cost the government to build the asset through public funding, which is then used to compare with how much it would cost to build it via PPP. VfM is defined as the optimum combination of whole life cycle (WLC) costs, risks, completion time, and quality in order to meet the public requirements (Grimsey and Lewis 2007). The VfM analysis based on WLC methodology gives due weight to operating costs in the trade-off against capital cost while evaluating the 'unitary charge' to be paid by the client or users. Although this drives efficiency in resource utilization, however, it also opens avenues for the private sector to justify higher capital investment in order to achieve these operating efficiencies. Hill and Collins (2004) have highlighted that the potential of WLC methodology is undermined in practice by projecting higher savings in operating costs by adopting a sustainable design

in order to justify increased capital costs without taking into account the extent of the associated risks, which the contractor will try to keep as low as possible. Such practice brings a serious challenge to the resource maintenance and efficiency principle in the form of a rebound effect that occurs when savings from efficiency gains are spent on more production and consumption. Gupta (2011) has mentioned that the VfM estimation tool developed by Indian PPP cell of Department of Economic Affairs, Government of India still needs improvement as the estimation of VfM is still subjective in nature, thereby promoting a misleading practice in selection of PPP projects. Estimating the cost and benefits for VfM under different delivery modes is not straightforward and transparent. Further, researcher stated that the 'VfM analysis heavily relies on the estimates made by the procuring agencies and on the experienced person(s) conducting the analysis' since not all specifications are hard coded. In addition to this, the risk model used in VfM analysis is very basic and outdated and it fails to model the complex risk/reward profile of PPP projects (Curnow et al. 2005). Also, Samuel and Oshani (2012) have mentioned that the VfM estimation does not take into consideration environmental and social externalities. An inadequate weightage to these externalities could be leading to failure of the long-term integrity of socio-ecological systems. As well, Lockie (2003) has indicated that incorporating of resource maintenance and efficiency sustainability principles in the VfM model will lead to a selection of more sustainable PPP projects if the value for money equation is broadened to consider environmental and social externalities and cost savings. In PPP project procurement, environment impact assessment (EIA) along with social impact assessment (SIA) are the tools commonly used in a full feasibility study to appraise the extent to which the infrastructure development will have an adverse effect on the surrounding environment and whether the proposed facility will maintain the integrity of the socio-ecological system (DEA 2014). However, it has been reported that EIA is inadequate in ensuring the promotion of sustainable project outcomes. EIA all too often focuses on acceptable impacts instead of optimizing the project for environmental, social, and community benefits (Arce and Gullon 2000). EIA is also not equipped to reflect the long-term environmental and social impacts of infrastructure development (UNESCAP 2007). Mahalingam (2010) has mentioned that the social pressures from activists protesting against inequitable resettlement and environmental degradation led to difficulties in implementing PPP projects. The researcher further summarized that the urban PPP project in India could be canceled due to social or environmental protests.

Similarly, PPP projects like the Timarpur-Okhla Integrated Municipal SWM Project in Delhi and the Latur Water Supply Project have been delayed by almost a year due to the opposition of social communities and local residents on environmental and asset transfer grounds, respectively (Gupta 2011). The manner in which the EIA is being carried in the procurement of PPP projects also does not ensure to fulfill the long-term integrity of socio-ecological system sustainability goals. As per the procurement process, many decisions relating to the design and operation of the project that influence environmental performance are made after the EIA (Arts and Faith-Ell 2012). This practice prevents a transfer of information from planning stage to implementation stage and restricts the application of sustainability requirements through more open and informed deliberations and decision-making with all the project stakeholders.

Bid proposals submitted by private players in the case of PPP projects are normally evaluated with respect to the various aspects relating to technical feasibility and financial sustainability and the bid is awarded to the private entity with the maximum score on these factors (Planning Commission 2009). But, the Social and environmental dimensions are not given their due weight during the evaluation process for awarding a contract (Hill and Collins 2004; Samuel and Oshani 2012). In addition, evaluation of bids is still based on the lowest price rather than the best value (Curnow et al. 2005). The capabilities and expertise of the private player in terms of their ability to promote social and environmental sustainability are not assessed and taken into consideration when awarding the bid. UNECE (2008) has highlighted that private stakeholders do have a comprehensive understanding of environmental and social sustainability. Private sector expertise could be put to better use in meeting not only minimum standards for clearance but in creating a competition for social and environmentally sustainable solutions for continuous improvement. The private sector can also introduce technological changes that could bring improvements in material and energy efficiencies through optimizing production by decreasing material and energy inputs, and cutting waste through product and process redesign (UNECE 2008). However, in order to streamline the PPP procurement process, the deciding criteria for selecting the preferred bidder is based on service provision at optimal financial cost, taking precedence over the technological aspects of the project. It has been observed that when bid evaluation criteria are in financial terms only, the private player tends to focus on maximizing returns and recovering the investment cost by making crucial changes in the project (Arts and Faith-Ell 2012). Previous PPP projects in India,

such as the Gangavaram Port Project and Nhava-Sheva Integrated Container Terminal, failed due to insufficient bidding criteria with respect to various environmental and social issues (DEA 2010b). Therefore, Samuel and Oshani (2011) have mentioned that the PPP procurement process should thus embed environmental and social safeguards in the tender evaluation, supplier selection, and monitoring and contract functions.

4.3.2 Intra-generational inequity & lack of livelihood sufficiency and opportunities

A sustainable PPP project should not only ensure that all sections of the society have access to the infrastructure services so that intra-generational equity is ensured, but it should also facilitate a decent livelihood for everyone and even provide opportunities to seek improvements without comprising future generations' access to measures to ensure livelihood sufficiency and opportunity. The government, where necessary and appropriate, could consider levying user fees to generate financial resources for rehabilitation, redevelopment, construction, or replacement of project assets and their ongoing operation and maintenance in order to provide good quality public assets and/or related services. The determination of such user charges could be based on the principles including, but not limited to, partial or full recovery of the costs, savings to users, efficiency gains, willingness to pay, need for subsidies, and affordability. But the regulatory mechanism put in place for provision of many public assets and/or related services has natural monopolistic characteristics, and should be regulated to ensure that the interests of users and service providers are protected, taking into consideration the affordability for the users and certainty of pricing and revenue stream for the private party (DEA 2011). However, one of the most common complaints by the general public against PPP projects is the high tariffs charged for the services provided by the private sector. In the case of the Dabhol Power Project in the state of Maharashtra, assumptions regarding the affordability of the infrastructure services from the proposed facilities were erroneous and poorly designed making the tariff unaffordable for a certain section of the society (Mahalingam 2010). Similarly, the Coimbatore Bypass Toll Road Project in the state of Tamil Nadu increased toll charges after four years (Gupta 2011), which will make it inaccessible to some sections of the society; thus failing to provide equal opportunity for growth, and increasing the gaps between rich and poor. Unless the governments adopt cross-subsidization to provide equal opportunities, the infrastructure development will fail to promote intra-generational equity. The participation of the private sector in providing public services will undoubtedly

bring innovations and efficiencies to the operations, but may produce a fear of downsizing in the public sector and reduce employment opportunities for the general public (Li 2003; Li et al. 2005b). Cheung (2009) have stated that if proper regulatory measures are not implemented the employment opportunities will reduce to a certain extent. This will reduce stakeholder acceptability and makes the project unsustainable, as the affected stakeholders will be deprived of the opportunities to lead a decent life.

In order to streamline the procurement of infrastructure projects through PPPs, the government has put in place a well-defined bidding process along with the model bidding documents (model RFQ and model RFP). However, the bidding process suffers from high transaction and tendering costs due to the detailed and lengthy nature of the bidding process (Taseska 2008). Also, the PPP procurement process involves several lengthy negotiations that will be required for formation of the contractual framework may leading to slow down of bidding process (Cheung and Chan 2011; Grimsey and Lewis 2007; Li 2003). It has been indicated that transaction costs relating to bidding for PPP projects are six times higher than those of traditional procurement arrangements (Chan et al. 2008; Chan et al. 2010; Cheung and Chan 2011). PPP projects employ the services of various professionals, which are highly costly, for structuring project deals (Chan et al. 2006; Corbett and Smith 2006; Li et al. 2005a). High bid cost reduces competition and the value of the project (DTF 2007; Kwak et al. 2009). Mahalingam (2010) mentioned that many local bodies in India are usually involved in the implementation of projects and private agencies often need to procure permits, and approvals from several agencies. This considerably increases the transaction costs of a project and often necessitates exchange of bribes in order for the project to move forward. In such circumstances, it is very unlikely that smaller local and regional contractors will be able to participate in PPP infrastructure projects. The majority of PPP projects are larger than those that many small contractors realistically aspire to bid for (ACID 2003). This limits the availability of effective choices for small contractors and increases the dangerous gaps in opportunity between the private players, leading to failure to ensure intra-generational equity for different classes of private sector parties, and such practice will compromise their access to opportunities that could help them to fulfill the principle of livelihood sufficiency and opportunity.

4.3.3 Failure to promote socio-ecological civility & democratic governance

In a PPP arrangement, the private sector and the public entity enter into a partnership with the main objective to build the projected facilities and deliver the infrastructure services in an effective manner. The decision-making practices for infrastructure development and implementation should focus on making the key decisions through more open and better informed deliberations, bringing transparency into the decision-making process and fostering awareness and collective responsibility. In order to promote such practices, the decision-making bodies should have the requisite capacity, motivation and inclination to incorporate sustainability principles in the decision-making process. PPP projects require multidisciplinary and highly specialized expertise on account of the complex nature of a business transaction. The PPP section in the Department of Economic Affairs provides technical support and expertise to government ministries and other authorities developing PPPs. It consists of specialists from different areas (finance, law, engineering, planning, etc.) with experience in both public and private sectors (DEA 2011). The typical actors/experts involved in PPP procurement include the project sponsors representing the equity investors, transaction advisors, financial institutions, legal experts, EIA consultants, technical consultants, and representatives of the public authority. Although the procurement process has been streamlined to a large extent, the key actor's involved in PPP procurement lack the requisite skill and knowledge about sustainability concepts and green concepts as applied to infrastructure development (Hill and Collins 2004; Samuel and Oshani 2012). Mahalingam (2010) has highlighted that the public officials in India are not well trained in areas such as financial and legal structuring that are key to PPP transactions and are not used to new kinds of contractual arrangements such as PPPs where risk and responsibility are shared between the private and the public sector. In addition, the procurement and evaluation team do not normally have the inclination to encourage innovative solutions from the private sector that deliver sustainability (UNECE 2008). Samuel and Oshani (2011) have suggested that the enhancing of the public sector capacity and education is a compulsory component of developing sustainable PPPs. Lack of understanding about sustainability and green concepts among the experts could lead to a situation where they fail to understand the importance of promoting socio-ecological civility and democratic governance in decision-making, thereby preventing promotion of innovative solutions for sustainable development.

Ensuring transparency in bidding processes is the topmost priority of the government; transparency will retain the trust of the stakeholders. The government has consciously moved towards competitive bidding and maintenance of transparency in the award of infrastructure projects through PPP. Further, audit mechanisms have been put in place to maintain transparency, equity, and fairness in developing and implementing projects. To promote wider participation and transparency in the process, initiatives such as e-tendering and auction have been promoted (DEA 2011). But accountability and transparency of financing and the contractual arrangement are distorted, as private sector funding components fail to appear on public spending records (Cheung 2009; Samuel and Oshani 2012). The public disclosure of concession agreements has been made mandatory as per the model concession agreement, but the details relating to project financing are not publicly accessible since the private sector data on profits, costs, or lessons learnt are considered issues of commercial confidentiality by them (Samuel and Oshani 2011). In addition to the lack of transparency, the decision-making process lacks the involvement of nongovernment and non-market groups (Taseska 2008). Past PPP projects in India, such as the Dabhol Power Project and Pune Water Supply and Sewerage Project, were canceled due to the lack of transparency and competition in the bidding process (Tiwari and Ashish 2013). The lack of transparency and accountability in the public sector during bidding process could be leading to failure of socio-ecological civility and democratic governance principle of sustainability. PPPs also do not incentivize the private parties to structure the project such that it allows integration of informal sectors and institutions in the provision of services. However, the inclusion of such incentives will help in ensuring that even the informal sectors will have the opportunity to seek improvements and gain from the benefits of infrastructure development.

The success of PPP projects requires the active participation of the public in all the phases of the project starting with the planning and design phase through to the operation phase. The public authority needs to put in place an appropriate stakeholder management system. Such a system will allow active participation and act as a communication mechanism to send out clear and consistent information while developing PPP projects. A coherent and strategic approach to communication so as to inform and engage stakeholders is critical for mobilizing broad-based support for successful project development and implementation. The public would be engaged during the project development process and the implications of a project would be explained and opportunity given to all stakeholders

to raise their concerns. The regulatory and legal framework would also promote and protect the wider public interest, including users of public services. However, in the recent past, issues like land acquisition, heritage site protection, and environmental pollution have resulted in public opposition, overblown costs, and delays to most of the PPP projects (Chan et al. 2010; Cheung 2009; Cheung and Chan 2011). Opposition by the local population and contractual disputes between the public and private sectors make PPP unsustainable (Hamilton and Holcomb 2012). A few high-profile examples of public unrest leading to cancellation or delay of PPP projects in India include the Timarpur-Okhla Integrated SWM project (public opposition on environmental ground), the Latur Water Supply Project (public opposition on 'right to water sentiment'), the Coimbatore Bypass Toll Road (local resident's refusal to pay tolls), and the Delhi water privatization (public opposition on 'right to water sentiment') (Gupta 2011). The approach of stakeholder's opposition on various issues could be failed to accomplish the socio-ecological civility and democratic governance goal of sustainability and faced the time and cost overrun in the development of PPP projects.

The development of PPP infrastructure projects normally depends on relationships between public and private sector. But, the goals of the private sector fundamentally oppose those of the public sector: the former focuses on economic gain while the latter strives to protect the public interest through regulation and minimization of risk (UN-HABITAT 2011; UNESCAP 2007). Conflict of goals between the private sector and government sector is an important issue, which should be taken care of by government to achieve the socio-ecological civility and democratic governance goal of sustainability. There are instances of failure of PPP projects in India due to conflicting goals between public and private sector. For instance, Karur Bridge Project, which was developed through BOT route, had to be canceled when the newly elected municipal government (public sector) unilaterally canceled the concession agreement signed by the previous government on the pretext of a damaged approach road without compensating the concessionaire (Gupta 2011; Mahalingam 2010). Also, the 'Kaman Paygon BOT' project in Maharashtra has been terminated (pre-closed) and right of the company to collect toll was rescinded due to the conflict between IRB Pvt. Ltd. (private sector) and Government of Maharashtra, PWD on widening of the road (Tiwari and Ashish 2013). The issue of goal conflict between public and private sector due to social and environmental issues could be leading to failure of 'socio-ecological system integrity' principle of sustainability.

Samuel and Oshani (2012) have suggested that the PPPs should embed environmental and social safeguards in their goals, designs and specifications. One of the possible mechanisms to achieve this is through an incorporation of clauses promoting sustainability in the model concession agreement.

4.3.4 Inadequate precautions and adoption measures

The concession agreement for PPP projects defines in detail the roles and responsibilities of both the public and private parties and explains how to address the adverse effects of the uncertainties that may arise during the concession period and who should bear the consequences of those uncertainties. However, in order to streamline the procurement process, the government has standardized the concession agreement to address the typical issues of limited recourse financing of infrastructure projects and enable the private investors to secure a reasonable return at manageable levels of risk (Planning Commission 2009). Enhancing the bankability of the concession agreement has been the major objective. In order to achieve this objective, the concession agreement has been structured so as to ensure accuracy and predictability of the costs and obligations, and appropriate risk mitigation strategies have been devised so that the risk/reward profile is within acceptable limits for the private sector. This helps to sustain the investors' interest but at the cost of building flexibility into the contract. The concession agreement can be for at least a couple of decades and over such long duration various uncertainties different from the risks envisaged at the project's conceptual stage could emerge that could affect the different communities and ecosystems. In case the uncertainties are the result of unanticipated long-term effects of the project's design or operation, or problems emerging from increasing socio-ecological complexities, necessary precautionary measures could not be planned at the conceptual stage and the corresponding risks and risk mitigation mechanisms will not be built into the concession agreement. Moreover, the private sector has less willingness to act on incomplete but suggestive indications of significant risk to social and ecological systems and such risks could not be allocated to the private sector. The model concession agreements are in fact rigid contracts and it will be difficult for governments to structure contracts that take into account future unforeseen events or circumstances wherein the contractual responsibilities can change and adapt as the context changes (Clifton and Duffield 2006). PPP projects in India, such as Delhi International Airport and the Dabhol Power Project, have been delayed and canceled, respectively, due

to future unforeseen impacts like political changes in the public sector (Gupta 2011). On the other hand, if there are no provisions for responding to the changed environment surrounding the project then future generations will continue to adhere to outdated operations from previous decades. The concession agreement which delegates the responsibility for design, finance, construction, operation, and maintenance to the private entity for a long period should be structured based on a precautionary approach that favors flexibility and reversibility. The model concession agreement clearly defines the roles and responsibilities of the parties to the contract for delivering pre-defined specifications of infrastructure services and includes provisions such as dispute resolution mechanisms to settle disputes and termination provisions to compensate the affected party in case the project's operating environment is drastically different from the expected business case scenario. Building flexibility into a model concession agreement is an expensive proposition as it will make the investment less secure; however, if the model concession agreement has to be designed for flexibility and reversibility then it may become necessary to further incentivize the private sector to adopt a precautionary approach and adapt to a new operating environment. Besides giving incentives to the private sector, the contractual provision on dispute resolution should include provision for renegotiation of the concession agreement so that in the event of the change in the operating environment the roles and responsibilities of the public and private sectors can be restructured.

4.4 Summary

Although the procurement process of PPP projects has mechanisms to evaluate whether PPP route is leading to VfM, but performance of PPP projects has been criticized on sustainability aspect. This chapter has dealt with this argument through literature review using qualitative analysis in order to systematically identify the deficits in PPP procurement process from the perspective of sustainable development. The key shortcomings in the PPP procurement process identified from the review have been grouped under four major themes, namely: (i) inefficient resource utilization and failure to promote the integrity of the socio-ecological system, (ii) intra-generational inequity and lack of livelihood sufficiency and opportunity, (iii) failure to promote socio-ecological civility and demographic governance, and (iv) inadequate precautions and adoption measures. These shortcomings have resulted in the inefficient promotion of sustainable development objectives through the deliverables of the PPP procurement process. The

deliverables including the environmental impact assessment (EIA); value for money analysis (VfM); stakeholders participation; risk allocation and mitigation; incentives to private sectors, user charges for services; bidding and transaction cost; sustainability knowledge of public sector; relationship between public and private sector; transparency and accountability during bidding; and bid evaluation criteria. These deliverables will need to be enhanced from the perspective of sustainable development principles. These identified deliverables are used as conceptual areas for development of the preliminary framework in the next stage of this research.

It has been preliminarily confirmed from the above review of PPP procurement process from sustainability perspective that there exist numerous shortfalls in PPP process highlighting that infrastructure development through PPP route is not in accordance with the sustainability principles. Figure 4.2 has summarized the shortfalls in PPP procurement process fails to accomplish the respective principles of sustainability. There is thus a need to incorporate sustainability principles in the conceptual areas/deliverable of the PPP procurement process so that it contributes to sustainable development. The next chapter/stage 2 of the research will bring the focus on the possibility to integrate sustainability in the conceptual areas/deliverable of the PPP procurement process.

CHAPTER 5

DEVELOPMENT OF PRELIMINARY FRAMEWORK

5.1 Introduction

This chapter presents the second research stage of the study where in the identified conceptual areas from the stage 1 have guided the formulation of the preliminary framework of strategies on how to integrate sustainability principles in PPP process. The main aim of this stage is conceptualization of the preliminary framework explaining how the formulated strategies can be integrated into PPP procurement process. The proposed framework is based on four levels of principle-based approach – Level 1 - Three dimensions of sustainability, Level 2 - Core principles of sustainability (i.e. Gibson's principles), Level 3 - Guiding principles of sustainability, and Level 4 - Strategies to comply with the prerequisites of guiding principles. Out of these four levels, first two levels (dimensions and core principles) have already been investigated through the literature review in chapter 2. In this stage, the last two levels (guiding principles and strategies) will be the focus of this stage. Along with the development of guiding principles and strategies, the last step of this stage is also to integrate the formulated strategies in conceptual areas of PPP procurement process. In order to achieving of this objective, the following three steps approach have been adopted: (i) Exploring the guiding principles to assess the sustainability of infrastructure projects in accomplishing the prerequisites of core principles, (ii) Formulation of strategies from the best practices PPPs to accomplish the goals of guiding principles, and (iii) Integration of strategies in conceptual areas of PPP procurement process to fulfill the prerequisites of sustainability principles.

This chapter comprises of four sections. The second section describes the development of guiding principles to accomplish the goal of sustainability through constant comparison analysis with core principles and three dimensions of sustainability. The third section focuses on the development of strategies, which helps to accomplish the goals of guiding principles, from worldwide PPP best practices through constant comparison analysis. The final section deals with the discussion on the development of the preliminary framework of strategies on how to integrate the sustainability principles in conceptual areas of PPP procurement process through mapping process.

5.2 Guiding Principles for Sustainability Assessment

Robert (2000) has proposed the concept of hierarchical framework of sustainability principles for sustainability assessment of infrastructure projects. In the similar lines, other researchers have also developed similar frameworks for sustainability assessment in other sectors. For instance, Kettle (2006) for decision making of urban water infrastructure sustainability; Hubbard (2009) for measuring organizational performance; Gronlund et al. (2004) for sustainability of wastewater treatment; and Byggeth and Hochschorner (2006) for sustainable product development and procurement. The hierarchical framework proposed by Robert (2000) comprises of four levels and these levels have been the basis for formulation of guiding principles and strategies to improve the procurement process. Table 5.1 shows how the framework proposed by Robert (2000) has been used for the present study.

Table 5.1: Four hierarchical levels for sustainability principles

Level	Hierarchical levels for sustainability principles	Interpretation of principles for proposed preliminary framework
I	Principles that describe the system, these are constitutional principles	Three dimensions of sustainability: Social, environmental, and economic
II	Principles that determine favorable outcomes in a system	Gibson's principles for sustainability: Eight core principles for sustainability assessment
III	Principles that describe how to reach a favorable outcome in a system	Guiding principles for sustainable infrastructure development to fulfill the core principles of sustainability
IV	Various activities that must be aligned with those principles	Strategies from the best practices PPPs to fulfill the goal of guiding principles for sustainable development

The first level relates to the three dimensions of the sustainability, i.e. social, environmental and economic while the second level refers to the principles to promote favorable outcome from the system in terms of the Gibson's core principles for sustainability. The core principles of sustainability postulated by Gibson are abstract statement, these principles require further descriptions along with examples to make them more meaningful and useful. The guiding principles, therefore, provide detail explanation on how to operationalize the core principles of sustainability. These guiding principles will be act as a guideline in determination of strategies to promote sustainable practices at

various stages of PPP infrastructure project so that sustainable development goal can be achieved.

5.2.1 Data collection and analysis

A comprehensive literature review has been carried out using literature review through qualitative analysis to explore the guiding principles. The literature on sustainability practices being adopted by various engineering organizations for infrastructure development has been the focus of the qualitative analysis. The preliminary list of articles for literature review was selected using the keyword ‘principles of sustainability for infrastructure development’ in Google Scholar search engine. The final list of literature was then screened using two criteria: (i) publications were selected based on whether they included international overviews of the sustainability assessment; and (ii) accessibility of publications to a wide international audience. A total of 22 key documents were selected and subjected to comprehensive review for identifying the guiding principles for sustainable infrastructure development. The selected articles include 07 research articles, 09 research reports, and 06 online sources.

After identification of the guiding principles, classical content analysis and constant comparison analyses were carried out to count the number of articles coded under each guiding principle and classify the guiding principles based on the goals of core principles of sustainability fulfilled by those guiding principles, respectively. The last column of Table 5.2 shows the result of the classical content analysis. It has been observed from classical content analysis that the guiding principle ‘Environmental Protection’ coded highest number of sources (i.e. 17 times), while the guiding principles ‘Up-gradation’ and ‘Risk Management’ coded the lowest number of sources (i.e. 5 times).

Table 5.2: Literature review and coding of guiding principles

Sl. No.	Guiding principles (Open code / Free node)	Sources or Authors																							Total sources coded
		Research articles							Research reports								Online source								
		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v		
1	Environmental protection – Reduce the impact on life support system & ecological services	√	√	√	√	√	√	√	√	√		√		√	√	√		√		√		√	√	17	
2	Polluters pay – Plan for pollution cost and compensation			√			√		√	√	√				√	√						√	√	09	
3	Quality of life – To ensure provision of key prerequisites for decent life	√		√		√			√		√	√					√				√			08	
4	Creativity – Encourage innovation, flexible for change and share a knowledge					√			√	√				√	√	√		√					√	08	
5	Up-gradation – Education, training, participation and awareness								√					√	√			√					√	05	
6	Affordability – Affordable user charges/ customer satisfaction				√		√			√	√						√				√			06	
7	Social justice and poverty alleviation – Improving well-being of all community	√			√		√		√		√	√	√		√	√	√	√		√				12	
8	Equitable distribution of resources between present and future generation	√	√	√	√		√		√		√				√	√		√		√			√	12	
9	Long-term strategic planning for commercial viable or bankable service	√							√				√	√			√	√			√			07	
10	Maintenance of natural resources – Use of renewable resources	√		√	√	√			√							√	√			√	√	√	√	11	
11	Value for Money – Improve quality, cost, access and the financial viability					√			√	√	√						√	√	√		√		√	09	

Contd.

Table 5.2 (Contd.)

Sl. No.	Guiding principles (Open code / Free node)	Sources or Authors																						Total sources coded
		Research articles							Research reports								Online source							
		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	
12	Efficient project delivery – Adopt efficient processes and technologies					√					√		√				√	√			√	√		07
13	Public participation – Consultation of all stakeholders / Users participation	√		√	√	√			√	√		√	√	√	√	√	√	√	√	√	√	√		17
14	Institutional capacity – Strong organization and leadership	√			√	√			√	√	√		√	√						√		√	√	11
15	Accountability – Transparency in decision making by Government				√				√	√	√	√		√	√		√		√	√	√			11
16	Risk Management – Balance risk profile between government and private sector				√								√						√		√	√		05
17	Adaptability and Resiliency – Consider of future impact and uncertainties	√	√						√	√	√										√	√		07
18	Precautionary – Identification of problems and its solution	√			√		√		√	√	√	√		√	√	√		√				√		12
19	Multidimensional – Integration of 3 dimensions of sustainability to seek a balanced solution		√				√						√	√	√	√	√		√				√	09
20	Continuum – Representing various degrees of sustainability		√						√	√	√		√		√		√	√						08

[Sources: a - Luederitz et al. (2013); b - Ramani et al. (2011); c - Berke and Conroy (2000); d - McKercher (2003); e - Terry and Tony (2011); f - Millar (2009); g - Harris (2000); h - UNCED (1992b); i - RAE (2005); j - IAIA (2003); k - DME (2009); l - OECD (2001); m - UNDES (2012); n - CEC (2005); o - NSDSS (2007); p- FIRE (2011); q - OSE (2013); r - Cledan (2005); s- UBC (2013); t - YRGM (2007); u - IISD (2013); v - MHEENG (1993)]

Further, the second and third cycle of coding procedure had been conducted for the constant comparison analysis. In second and third cycle of coding, the core principles and three dimension of sustainability have been coded through axial and selective coding as tree nodes in NVivo10, respectively. Then, the constant comparison analysis had been conducted to classify each guiding principle based on the extent of fulfillment of the goals of core principles and three dimension of sustainability. Table 5.3 shows the classification of the identified guiding principles with their respective core principles and dimensions of sustainability being fulfilled by the principles.

Table 5.3: Guiding principles to accomplish the goals of sustainability

Level I: Dimensions of sustainability	Level II: Core principles of sustainability	Level III: Guiding principles of sustainable infrastructure development
Environmental Sustainability	Socio-ecological system integrity	Environmental protection
		Polluters pay
	Precaution and adaption	Adaptability and Resiliency
		Precautionary
		Risk Management
Social Sustainability	Livelihood sufficiency and opportunity	Quality of life
		Creativity
		Up-gradation
	Intra-generational equity	Affordability
		Social justice and poverty alleviation
	Intergenerational equity	Equitable distribution of resources
		Long-term strategic planning
Economic Sustainability	Resource maintenance and efficiency	Maintenance of natural resources
		Value for Money
		Efficient project delivery
	Socio-economic civility and democratic governance	Public participation
		Institutional capacity
		Accountability
All three dimensions of sustainability	Immediate and long-term integration	Multidimensional
		Continuum

It has been observed through constant comparison analysis that all the guiding principles have fulfilled the goals of core principles and three dimensions of sustainability. The final set of guiding principles with core principles are Socio-ecological system integrity:

Environmental protection, Polluters pay; Precaution and adaption: Adaptability and resiliency, Precautionary, Risk management; Livelihood sufficiency and opportunity: Quality of life, Creativity, Up-gradation; Intra-generational equity: Affordability, Social justice and poverty alleviation; Intergenerational equity: Equitable distribution of resources, Long-term strategic planning; Resource maintenance and efficiency: Maintenance of natural resources, Value for money, Efficient project delivery; Socio-economic civility and democratic governance: Public participation, Institutional capacity, Accountability; Immediate and long-term integration: Multidimensional, Continuum.

5.2.2 Guiding principles for sustainable infrastructure development

The guiding principles derived from the content analysis have been grouped under the eight core principles of sustainability.

Socio-ecological system integrity

- Environmental protection – The basic aim of this principle in the context of infrastructure development is to ensure protection of the surrounding and human beings while undertaking construction of any infrastructure project. Infrastructure projects which are built through PPP route should also focus on protection, preservation, and restoration of the natural environment.
- Polluters pay – The disposal of any waste from built infrastructure in an unscientific manner will lead to adverse effects on both the society and environment. The adverse effects on the environment and society of any decision should, therefore, be compensated by the proponent of the infrastructure project. This should not be transferred to others without fair compensation.

Livelihood sufficiency and opportunity

- Quality of life – The concept of quality of life in the context of infrastructure projects development will include enhancement of local skill and capability; enhancement of public health and safety; minimize noise; ensure better community mobility and site accessibility; and preserve history, culture, and heritage. In PPP projects, key provision for promoting quality of life could be in the form of incorporation of penal clauses for non-conformity with standards of quality of life. Furthermore, this aspect could be

incorporated as one of the bid parameters on measures that will be included in project to improve the quality and reduces the cost of infrastructure facility.

- Creativity and promote innovation – The main objective of this principle is to encourage public sector officials to devise innovative solutions and implement practices for sharing important information and knowledge with subordinates. The sharing of relevant information on a timely basis with employees, interested people and governments will help in promoting a greater understanding of current situation and help to plan business activities and identify mitigating measures for the impacts associated with the project.
- Up-gradation of knowledge – One of the key principles is creating awareness about the new techniques and technologies relating to promoting of sustainable development through education, training, participation and awareness programs. In the context of PPPs, along with the up-gradation of public sector officials' knowledge, the public sectors officials should conduct awareness program to inform infrastructure users and local communities about environment, social and economic impacts of the project.

Intragenerational equity

- Affordable user charges – Promotion of intra-generational equity in the context of infrastructure projects will require making the services affordable and accessible to all sections of the society. The service providers should pay special attention to providing infrastructure services to those segments of the society that are normally excluded, such as the poor, migrants, lower castes, or tribal people, because they systematically have greater difficulty in accessing regular services.
- Social justice and poverty alleviation – The main aim, as per this principle, for infrastructure development should be to improve the well-being of all the residents of the community, i.e. both the advantaged and disadvantaged groups. This objective should be the driving force while designing infrastructure development program through PPP also. The focus of the government should be to ensure that inequitable burdens are not placed on any one geographical location or socio-economic sector of the population and that the benefits of a sustainable community are accessible to all members of the community.

Intergenerational equity

- Equitable distribution of resources – One of the main objectives of sustainable development is to ensure that current and future generations enjoy an acceptable quality of life. There should also be an equitable distribution of resources between and among communities and future generations.
- Long term strategic planning – The aim of this principle is to ensure the long-term integrity and productivity of our economy, our environment, our natural resources and safeguards our human health. The long-term impacts of policy choices should be considered to ensure a sustainable legacy.

Resource maintenance and efficiency

- Maintenance of natural resources – Maintenance of natural resources will require promoting maximum utilization of renewable resources and conserve non-renewable natural resources through efficient use and careful planning. It is suggested that the services provision should not only contribute to public health, but also improve the environment and preserve natural resources, which include protecting wildlife habitats, open spaces, and wilderness while preserving biodiversity.
- Value for money – Value for money principle aims to improve quality, cost and access to infrastructure services, and ensure the financial viability of infrastructure at minimum cost to the government. The current PPP procurement process adopts a quantitative VfM analysis test conducted with the objective to determine whether the value of risks transferred to private sector under a PPP arrangement is justified considering the cost that private sector will charge for assuming those risks.
- Efficient project delivery – The generic definition of efficient project delivery is developing and adopting proven best practices in budgeting, scheduling, bid/contract management, and asset management so that returns from the projects can be improved substantively. From the perspective of PPP procurement, the focus should be on development and abiding by environmentally and socially responsible procurement policy that emphasizes long-term values and will become a model for other public as well as private organizations.

Socio-ecological civility and democratic governance

- Public participation – Public participation involves engagement of stakeholders to take into account their views, perceptions, knowledge and skills while developing the projects. The effective public participation could be in the form of users and local community participation during the development phase. This will provide a platform amongst the stakeholders to interact amongst them and resolve issues that could be a cause of conflict of interests amongst the various project stakeholders in operation stage.
- Strong organization and leadership quality – The organizations must establish clear plans and rules for service provision, regulate and monitor service quality, co-ordinate infrastructure project development, and deliver services efficiently and equitably. It is suggested that the public sector should assume ethical responsibility for leadership over the vision and values for PPP project and adhere to the decision model that maximizes economic results, minimizes environmental impact and restores degraded ecosystems.
- Transparency and accountability – The administrative framework should be strengthened to make authorities accountable for decisions made relating to design and engineering aspects of the project and should set examples of upholding the beliefs held by them. In order to improve transparency and accountability in PPP process, the public sector should set clear standards, conduct consistent monitoring, and ensure fairness and transparency while making decisions.

Precaution and adoption

- Balance risk allocation – A successful PPP contract will balance the risks between government and the private partner in an equitable manner. The objective of the risk allocation should be to optimally allocate the project risks rather than maximizing risk transfer to the private sector. In addition to this, the legitimate concerns of the stakeholders should be taken into consideration during risk allocation.
- Adaptability and resilience – Projects design should have the flexibility to adapt to the changing needs of society and generations over time. The risk allocation framework, which is one of the key components of project design, should have adequate provisions to tackle both present and future problems, issues and challenges. Maintaining and

enhancing the adaptive capacity of the ecological systems and human social systems associated with infrastructure facilities will help in fulfillment of the goal of 'adaptability and resilience' principle of sustainable development.

- Precautionary – The aim of this principle is to adopt a precautionary approach in case of existence of objective scientific uncertainty so as to avoid potential damage to people's health or to the environment. And, the preferred approach should be to deal cautiously with risk and uncertainty through precautionary measures in situations where there is a lack of clarity on the environmental impacts of the project activities.

Immediate and long-term integration

- Multidimensional – The main aim of this principle is to inter-relate the three dimensions of sustainable development, i.e. social equity; economic development; and environmental stewardship. And, these must be simultaneously addressed to meet the needs of current and future generations. Promotion to integrate these three dimensions of sustainability would help in achievement of the goal of 'multidimensional' principle of sustainability.
- Continuum – Sustainability is not represented by discrete indications of sustainability or non-sustainability but as a continuum representing various degrees of sustainability. To accomplish the objective of this principle through promoting coherence between all government policies and coherence between local, regional, national and global actions in order to increase their contribution to sustainable development. In addition to this, identify the potential positive and negative impacts of our proposed actions on infrastructure development, not only locally and soon but also outside our immediate local environment, organization and context, and into the future.

5.3 Strategies on Best Sustainability Practices for PPPs

Strategies for sustainable development are about making and implementing various initiatives in a realistic, effective and lasting way to integrate the principle of sustainability. The Organization for Economic Co-operation and Development (OECD 2001) defined strategies for sustainable development as a coordinated set of participatory and continuously improving processes of analysis, debate, capacity-strengthening, planning and investment, which seeks to integrate the short and long term economic, social and

environmental objectives of society through mutually supportive approaches wherever possible, and manages trade-offs where this is not possible. Further, OECD (2001) mentioned that the strategies are important and no order of priority should be implied. They do not represent a checklist of criteria to be met but encompass a set of desirable processes and outcomes which also allow for local differences. In case of PPP projects, it has been observed that PPP procurement process also need to be improved on sustainability perspective thereby making it necessary to formulate strategies on integrating sustainability related practices in the process.

Formulation of strategies for improvement of PPP procurement process with respect to the shortfalls identified in previous stage has been the primary objective of this study. The first step towards formulation of strategies has been to identify the best sustainability related practices which are being implemented while implementing PPP projects. These strategies were then compared with the activities associated with every deliverable of the Indian PPP procurement process.

The qualitative analysis through literature review has been conducted in this step for formulation of the strategies on integrating sustainability related aspects in PPP procurement process. Therefore, a comprehensive literature review has been carried out to formulate strategies from the best practices being adopted in implementation of PPPs all over the world. The preliminary list of articles for literature review was selected using the keyword 'best practices PPPs for infrastructure projects' in Google Scholar search engine. The final list of literature was then screened using two criteria: (i) publications were selected based on whether they included international overviews of the sustainability assessment; and (ii) accessibility of publications to a wide international audience. A total of 24 key documents were selected and subjected to comprehensive review for identifying the strategies. The documents selected for review include 05 research articles, 15 case study research reports, and 04 online sources/reports.

This qualitative data was then analyzed using NVivo 10 through the five steps of qualitative data analysis. In the first cycle of coding, each document was reviewed to identify the strategies and these strategies were coded through open coding as a free node in NVivo10. The coding process resulted in identification of 52 strategies. Out of 52 strategies, 15 strategies were discarded as these strategies are already being implemented in Indian PPP case. Table 5.4 shows the selected 37 strategies along with the sources for which each strategy has been coded.

Table 5.4: Literature review and coding of strategies from the best practices PPPs

Sl. No	Strategies from the best practices PPPs (Open code / Free node)	Research Sources / Authors																								Total sources coded
		Articles					Case study guides															Reports				
		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	S	t	u	v	w	x	
1	Strategic environmental assessment (SEA)		√	√																						02
2	Environmental friendly and smart growth techniques							√			√															02
3	Climate change (CC) considerations in EIA						√					√														02
4	Law regarding liability and compensation																						√	√		02
5	Flexibility in MCA on future climate change impacts						√		√																	02
6	Early participation of private sector	√							√							√			√							04
7	Clauses on cost sharing due to unusual site risks							√			√															02
8	Renegotiation mechanism to address socio-political issues	√															√									02
9	Additional bidding criteria to minimize waste						√				√															02
10	Incentives for adaption & mitigation of CC strategies										√									√						02
11	Market mechanism to develop own solutions on E&S issues															√								√		02
12	Flexibility for private sector to prepare a master plan	√							√							√	√									04
13	Sustainability awareness rising training program										√		√													02
14	Addition of E&S criteria in bid evaluation																					√	√			02
15	Comprehensive communication program to educate the users									√	√									√						03
16	Institute differentiated rates mechanism						√										√									02
17	Probity arrangements through probity advisors and auditors											√	√													02
18	Policy & program to adapt the changing needs of societies						√												√							02
19	Provision for additional finance for robust financing structure							√	√																	02

Contd.

Table 5.4 (Contd.)

Sl. No	Strategies from the best practices PPPs (Open code / Free node)	Research Sources / Authors																								Total sources coded
		Articles					Case study guide														Reports					
		a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	
20	Relational contracting for long term contract				√	√													√							03
21	Policy of strategic communication plan						√				√															02
22	Life cycle assessment (LCA) approach											√												√		02
23	Incentives to use renewable sources & biological materials						√							√												02
24	E&S costs and benefits in WLC estimation																					√	√			02
25	Climate change parameters and E&S impact in risk model											√				√						√	√			04
26	Green procurement to invite innovative bid						√															√	√			03
27	Training and awareness with perspective of E&S goals																		√			√	√			03
28	Early participation of financial institutions						√									√										02
29	Independent assessor for auditing of VfM estimation						√		√							√										03
30	Building information modeling (BIM) system											√		√												02
31	Community involvement through partnering									√	√										√					03
32	Upgrade viability gap funding (VGF) mechanism						√			√								√								03
33	Public-private interaction forums	√														√										02
34	Special purpose company (SPC)						√				√							√								03
35	National PPP training program: on-the-job training											√		√						√						03
36	Specialized sustainability advisors for consultation													√		√	√									03
37	Fairness and process auditors						√								√											02

[Sources: a - Mahalingam (2010); b- Arts and Faith-Ell (2012); c - Arce and Gullon (2000); d - Kumaraswamy et al. (2005); e - Parker and Hartley (2003); f - UNECE (2008); g - DOIT (2010); h - DOIT (2012); i - DEA (2010b); j - DEA (2010a); k - USDOT (2007); l - WEF (2012); m - WEF (2013); n - UN-HABITAT (2011); o - European Union (2009); p - European Commission (2005); q - CII (2011); r - NAO (2001); s - Valentine (2008); t - PEMSEA (2009); u - Samuel and Oshani (2011); v - Samuel and Oshani (2012); w - RAE (2005); x - Millar (2009)]

After identification of the strategies, classical content analysis and constant comparison analyses were carried out to count the number of articles coded under each strategy. These strategies were, then, classified according to the objective of the guiding principles being accomplished by those strategies. The last column of Table 5.4 shows the result of the classical content analysis. It could be observed from classical content analysis that at least 2 sources coded for each strategy and maximum 4 sources coded for some of the strategies.

Further, the second and third cycle of coding procedure had been conducted for the constant comparison analysis. In second and third cycle of coding, the guiding principles and core principles of sustainability have been coded through axial and selective coding as tree nodes in NVivo10, respectively. Constant comparison analysis was conducted to classify each strategy according to the goals of guiding and core principles of sustainability being fulfilled by them. Table 5.5 shows the classification of the identified strategies as per the guiding principles and core principles being fulfilled by those strategies. It could be observed through constant comparison analysis that all the strategies have fulfilled the goals of at least one guiding and core principles of sustainability.

Table 5.5: Strategies to accomplish the principle of sustainability for PPPs

Level II: Core Principles	Level III: Guiding Principles	Level IV: Strategies to accomplish the goal of sustainable development
Socio-ecological system integrity	Environmental protection	Strategic environmental assessment
		Environmental friendly and smart growth techniques
		Climate change considerations in EIA
Precaution and adaption	Polluters pay	Law regarding liability and compensation
	Adaptability	Flexibility in MCA on future climate change impacts
		Early participation of private sector
	Precautionary	Renegotiation mechanism to address social risk
		Clauses on cost sharing due to unusual site risks
Livelihood sufficiency and opportunity	Risk management	Include climate change parameters in risk model
	Quality of life	Additional bidding criteria to minimize waste
		Incentives for adaption of climate change strategies
	Creativity	Market mechanisms for own solutions on E&S issues
		Flexibility to private sector to prepare master plan
	Up-gradation	Sustainability awareness rising training program
		Addition of E&S criteria in bid evaluation
		Comprehensive communication program for users

Contd.

Table 5.5 (Contd.)

Level II: Core Principles	Level III: Guiding Principles	Level IV: Strategies to accomplish the goal of sustainable development
Intra- generational equity	Affordability	Institute differentiated rates mechanism
	Social justice	Probity arrangements through probity advisors
		Upgrade viability gap funding (VGF) mechanism
Inter- generational equity	Equal distribution of resources	Policy to adapt the changing needs of societies
		Additional finance for robust financing structure
	Long-term strategic planning	Relational contracting for long-term contract
Resource maintenance and efficiency	Maintenance of natural resources	Policy of strategic communication plan
		Life cycle assessment (LCA) approach
	Value for money	Incentives to use renewable energy sources
		E&S costs and benefits in WLC estimation
	Efficient project delivery	Independent assessor for auditing of VfM estimation
		Green procurement to invite innovative bid
Socio- economic civility and democratic governance	Public participation	Training & awareness with perspective of E&S goals
		Early participation of financial institutions
		Building information modeling (BIM) system
	Institutional capacity	Community involvement through partnering
		Public-private interaction forums
		Special purpose company (SPC)
	Accountability	National PPP training programs: on-the-job training
		Specialized sustainability strategic advisors
		Fairness and process auditors' as a third party expert

Finally, interpretation of the coded data was carried out through development of the theory using memo writing technique. The memo writing was conducted in two steps. The literature data coded under each strategy was, first, interpreted through subjective understanding by researcher. Each strategy was, then, described on how to fulfill objective of the respective principle of sustainability through memo writing. The brief explanation on how each strategy can help in accomplishment of the goal of the respective guiding principles for promoting sustainable infrastructure development procured through PPPs is summarized in Table 5.6. This brief explanation of each strategy has been used in framing the interview template in the next stage to test the feasibility of the strategies. The feasibility of these deductive finding would be tested through focused interviews in the next stage so as to develop the inductive grounded theory on the framework of strategies on how to accomplish the goal of sustainability through PPPs.

Table 5.6: Description of strategies to accomplish the goal of sustainability

Sl. No.	Strategy (Free node)	Description of the strategy to accomplish the goal of sustainability (Memos)
1.	Strategic environmental assessment	Use strategic environmental assessment (SEA) to incorporate environmental and social considerations into policies, plans and programs of PPP procurement process through pre-feasibility studies.
2.	Environmental friendly and smart growth techniques	Implement and install environmental friendly and smart growth environmental monitoring systems/techniques (green design) through rating tools like LEED BREEAM, CEEQUAL for contributing towards biodiversity conservation and fulfill the sustainability goals with respect environment and social impact of projects.
3.	Climate change considerations in EIA	Include the assessment of climate considerations as a part of EIA that includes the assessment of GHG emission from the project and climate change impact on the project
4.	Law regarding liability and compensation	Establish a law regarding liability and compensation for those persons who are adversely affected by pollution or who is creating the pollution.
5.	Flexibility in MCA on future climate change impacts	Current concession agreement should have the flexibility to address future unforeseen or unpredictable issues related to climate change, any disaster, and risks.
6.	Early participation of private sector through articulation of a legal policy	The enunciation of a legal act/ policy of the government that allowed for private participation in infrastructure and identified sectors where PPPs could be investigated as first-choice options for project procurement, which likely provide confidence to private players to participate in PPP projects.
7.	Clauses on cost sharing due to unusual site risks	Sharing of costs of unusual site risks by public sponsor agency, such as hazardous materials discovered on project site during construction.
8.	Additional bidding criteria to minimize waste	Including additional bidding criteria to promote utilization of energy efficient systems and various management techniques such as lean construction to minimize construction and operation related wastes.
9.	Incentives for adaption and mitigation of climate change strategies	Introduce incentives for adaption and mitigation of climate change strategies, like reducing the emission of greenhouse gases (GHGs) and minimizing energy use through design, efficient operation and fuel substitution or it also recognizes the use of GHG offsets.

Contd.

Table 5.6 (Contd.)

Sl. No.	Strategy (Free node)	Description of the strategy to accomplish the goal of sustainability (Memos)
10.	Market mechanisms to develop their own solutions on E&S issues	Introduce market mechanisms will be feasible to maximize benefits or minimize costs to develop their own solutions and responses to the environmental problems.
11.	Flexibility to private sector for preparation of entire master plan	Process flexibility to the private sector for the preparation of an entire master plan for the project so that it promotes innovative and competitive bids.
12.	Sustainability awareness and knowledge rising training program	Develop strategies for attitude change, including education and awareness rising and ensuring decision-making processes that give conscious attention to environmental and social objectives.
13.	Addition of E&S criteria in bid evaluation	Enhance bid evaluation criteria for contractor selection through the inclusion of environmental and social criteria (i.e. corporate social responsibility).
14.	Comprehensive communication program to educate the users	Arranging comprehensive communication program to educate the users about the necessity of increasing the toll rate for improved services, as when a new toll road saves them valuable time in commuting to work.
15.	Institute differentiated rates mechanism	Implement institute differentiated rates, specifically, adjust charges according to time, location and usage.
16.	Probity arrangements through probity advisors and auditors	Interact effectively with bidders during the tender process, consistent with appropriate probity arrangements through probity advisors and auditors for procurement.
17.	Policy and program to adapt the changing needs of societies	Design policy and program to consider the long-term (whole life of project) impact of the project on community and ecosystem; and adapt the changing needs of societies and generations.
18.	Provision for additional finance for robust financing structure	Project that is based on long-term plans with robust business cases, developed and tested over a number of years, help to ensure that the final project design and specification meet the needs of users and the wider community.

Contd.

Table 5.6 (Contd.)

Sl. No.	Strategy (Free node)	Description of the strategy to accomplish the goal of sustainability (Memos)
19.	Relational contracting for long-term contract	Integrating relational contracting approach in PPP for developing better and sustainable relationships for more productive construction project teams, and optimizing the necessarily long-term contractual arrangements of PPPs in particular. The concepts of trust and reputation of relational contracting would be minimizing the procurement transaction costs.
20.	Policy of strategic communication plan	The strategic communication plan should be part of a policy that explains the benefits of the program and can prevent the discussion from being defined by PPP critics, within the media and elsewhere.
21.	Life cycle assessment (LCA) approach	Adopt a life cycle assessment (LCA) approaches using a materials calculator to quantify and compare materials lifecycle impacts and also recognizes the use of materials that have environmental labels.
22.	Incentives to use renewable energy sources & biological materials	Provide incentives and subsidies to the private sector for considering design features and construction materials through promoting to use renewable sources and biological materials that will generate optimum whole life costs across the life of the contract.
23.	Environmental & social costs & benefits in WLC estimation	Include environmental and social (E&S) costs, and benefits (promoting to use of renewable energy sources and cost effective technologies) in WLC estimation for VfM analysis
24.	Climate change parameters & E&S impact in risk model	Include the parameters of climate change impact on the project, and long- term social and environmental impact from the project in risk model of VfM estimation.
25.	Green procurement to invite innovative bid	Promote green procurement through enhancement of procurement policy by giving the preference to that bid which uses innovative technologies to reduce pollution, climate change mitigation, and recycle of waste.
26.	Training and awareness with perspective of E&S goals	Develop strategies for attitude change, including education and awareness raising and ensuring decision-making processes that give conscious attention to environmental and social objectives.
27.	Early participation of financial institutions	Early participation of financial institutions (FIs) through an adoption of the equator principles for determining, assessing, and managing environmental and social impacts.

Contd.

Table 5.6 (Contd.)

Sl. No.	Strategy (Free node)	Description of the strategy to accomplish the goal of sustainability (Memos)
28.	Independent assessor for auditing of VfM estimation	Need to employ independent assessor with the knowledge of sustainability requirement to assess or check the VfM estimation with respect to achieving sustainability goals.
29.	Building information modeling (BIM) system	Adoption of building information modeling (BIM) system for better communication tool for stakeholder's participation in decision-making and providing greater clarity for all stakeholders across the project lifecycle.
30.	Community involvement through partnering	Encouraging community involvement through partnering between urban local bodies (ULBs) or local community-led NGO can play a key role in convincing the community on the benefits of PPP project.
31.	Upgrade viability gap funding (VGF) mechanism	Enhance current government payments support system like VGF in India, which is currently limited to 40% of the total project cost. In countries with lower demand growth prospects, a higher viability-funding cap may be necessary.
32.	Public-private interaction forums	Establish public-private interaction forums to understand each other better, own their shortcomings, hold open discussions, and work through issues that come up during the course of the project.
33.	Special purpose company (SPC)	Establish a special purpose company (SPC), jointly owned by government, users, and private developers as an institutional mechanism for development of projects.
34.	National PPP training programs - 'on-the-job training'	PPP unit should establish national PPP training programs to build the expertise of government officials, which include practical 'on-the-job training' as opposed to theoretical classroom lecturing.
35.	Specialized sustainability advisors for consultation	Specialized sustainability advisors need to be consulted in order to help the contracting authorities ensure that sustainability considerations will be consistently included in PPPs.
36.	Renegotiation mechanism to address socio-political changes	Include renegotiation mechanism in CA to address socio-political or economic changes which could not be handled through inflexible contract model.
37.	Fairness and process auditors	Appoint 'fairness and process auditors' as a third party independent experts, which provides a level of assurance to government sponsors, bidders & the public that the procurement process will be fair & equitable.

5.4 Development of Preliminary Framework

Preliminary framework explains how to improve the Indian PPP procurement process by identifying the strategies for improving the shortfalls of the procurement process from sustainability perspective. This has been done by mapping the strategies with the conceptual areas. The flow diagram for formulation of the preliminary framework is represented in Figure 5.1. The conceptual areas identified from the first stage of the study have been used as the intervention points for inclusion of the respective strategies (flow process appears as horizontally in Figure 5.1). And the framework of core and guiding principle has been used as the main sustainability criteria to achieve the sustainable infrastructure goals (flow process appears as vertically in Figure 5.1). The square box, shown in Figure 5.1, represents the matrix showing the mapping of strategies with conceptual areas of PPP process through integration of sustainability principles.

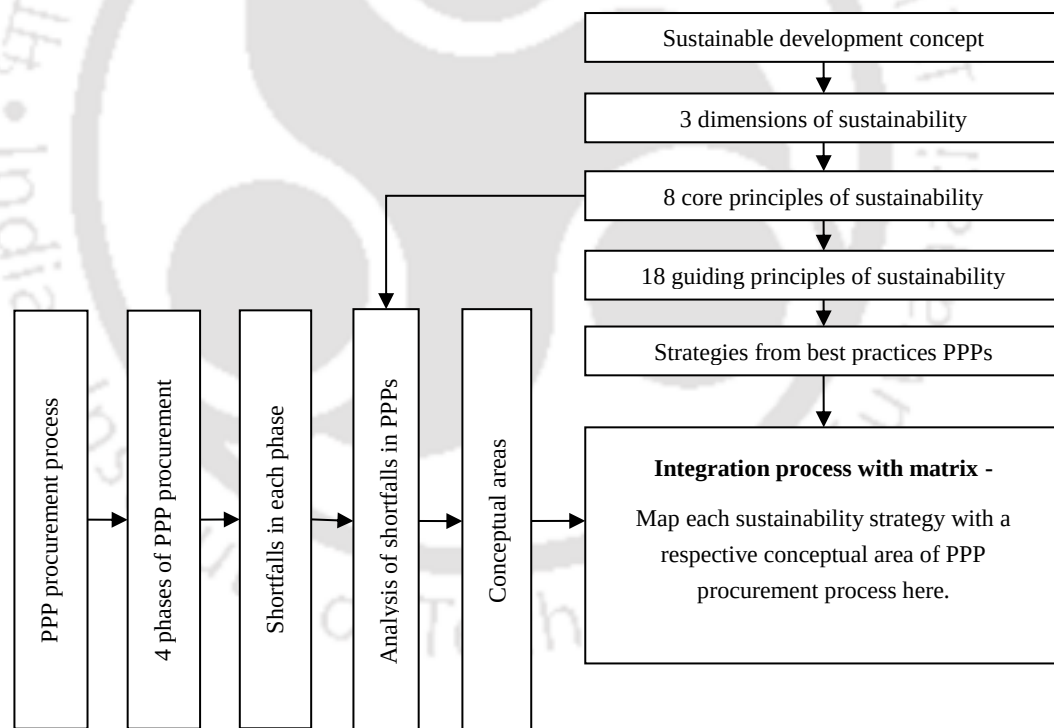


Figure 5.1: Flow diagram of formation of preliminary framework

The formation of preliminary framework by mapping the strategies was conducted using two factors/criteria: (i) strategies to accomplish the goal of respective sustainability principle; and (ii) strategies to enhance the specific conceptual area of PPP process through fulfilling the requirement of respective sustainability principle. The mapping was carried

out in two cycles. In first cycle of mapping, each strategy was interpreted from the perspective of the sustainability principle that will be fulfilled by that strategy using the results of constant comparison analysis (summarized in Table 5.5) and memo writing (summarized in Table 5.6). In second cycle of mapping, each strategy was further interpreted from the perspective of the conceptual area of PPP process that will be improved in terms of the sustainability goal relating to the concerned principle of sustainability.

The integration of conceptual areas and strategies have been done through mapping in the matrix shown in Table 5.7. Table 5.7 illustrates the strategies relating to the specific core sustainability principles and the corresponding shortfalls or conceptual area that should be overcome to ensure sustainable infrastructure development through PPP. The mapping of the strategies, principles and shortfalls have been done using the symbol ‘√’, which indicates that the strategy has fulfilled the requirement of the respective principle of sustainable development and, in the process, will help in overcoming the respective shortfall in PPP procurement process. The discussion on preliminary framework integrating sustainability principles through strategies in conceptual areas of PPP process is explained in the next section.

Table 5.7: Mapping of strategies with principles of sustainability and conceptual areas in PPP process

Code	Strategy to enhance the sustainability of PPP procurement process	Core principles of sustainability						Conceptual areas in PPPs										
		1	2	3	4	5	6	a	b	c	d	e	f	g	h	i	j	k
ST1	Strategic environmental assessment	√	√					√										
ST2	Climate change considerations into EIA	√	√					√										
ST3	Environmental-friendly and smart-growth technique	√	√					√										
ST4	Early participation of financial institutions	√	√					√										
ST5	Include E&S costs & benefits in WLC estimation	√	√						√									
ST6	Climate change parameters & E&S impact in VfM	√	√						√									
ST7	Life cycle assessment using a materials calculator	√	√						√									

Contd.

Table 5.7 (Contd.)

Code	Strategy to enhance the sustainability of PPP procurement process	Core principles of sustainability						Conceptual areas in PPPs												
		1	2	3	4	5	6	a	b	c	d	e	f	g	h	i	j	k		
ST8	Independent assessor for auditing of VfM estimate	√	√						√											
ST9	Environmental and social criteria in bid evaluation	√	√							√										
ST10	Additional bidding criteria to minimize waste	√	√							√										
ST11	Green procurement using innovative technologies	√	√							√										
ST12	Institute differentiated rates mechanism			√	√						√									
ST13	Modified viability gap funding mechanism			√	√						√									
ST14	Comprehensive communication program			√	√						√									
ST15	Relational contracting (RC) in PPP contract			√	√							√								
ST16	Flexibility to preparation of entire master plan			√	√							√								
ST17	Probity arrangements for integrity & honesty			√	√							√								
ST18	Special purpose company (SPC)					√							√							
ST19	Partnering with urban local bodies or NGOs					√							√							
ST20	Building information modeling (BIM)					√							√							
ST21	Renegotiation mechanism in MCA						√							√						
ST22	Flexibility in MCA for climate change impact						√							√						
ST23	Clauses on cost sharing due to unusual site risks						√							√						
ST24	Additional finance for robust financing structure						√							√						
ST25	Incentives for adaption of climate change strategies	√	√												√					

Contd.

Table 5.7 (Contd.)

Code	Strategy to enhance the sustainability of PPP procurement process	Core principles of sustainability						Conceptual areas in PPPs										
		1	2	3	4	5	6	a	b	c	d	e	f	g	h	i	j	k
ST26	Incentives to use renewable energy sources	√	√												√			
ST27	Market mechanisms for solutions on E&S issues	√	√												√			
ST28	Law regarding liability and compensation	√	√												√			
ST29	Policy of strategic communication plan					√										√		
ST30	Institutional bodies for scrutinize projects					√										√		
ST31	Fairness and process auditors as a 3 rd party expert					√										√		
ST32	Early participation of private sector					√											√	
ST33	Public-private interaction forums					√											√	
ST34	Sustainability awareness rising training program					√												√
ST35	Specialized sustainability strategic advisor					√												√
ST36	National PPP programs include 'on-the-job training'					√												√
ST37	Training & awareness with perspective of E&S goals					√												√

[Acronyms used in the Table: 1-Socio-ecological system integrity; 2-Resource maintenance and efficiency; 3-Livelihood sufficiency and opportunity; 4-Intra-generational & Inter-generational equity; 5-Socio-ecological civility and democratic governance; 6-Precautionary and adaptation; and a-EIA and SIA; b-VfM estimation; c-Bid preparation and evaluation; d-User charges for services; e-Bidding and transaction cost; f-Stakeholders participation; g-Risk allocation and mitigation; h-Incentives to private sector; i-Transparency and accountability during bidding; j-Relationship of public and private sector; k-Knowledge of sustainability]

5.4.1 Discussion on preliminary framework

The preliminary framework for enhancing the sustainability of PPP with respect to the conceptual areas using the strategies is discussed as below.

Integration of ‘socio-ecological system integrity’ and ‘resource maintenance and efficiency’ in EIA and SIA, VfM analysis, bid evaluation and incentive mechanism

The EIA focuses too often on acceptable impacts instead of optimizing the projects for environmental, social, and community benefits. There is scope for improving EIA and SIA by including provisions for considering the long-term impact of the project on environment and people. Samuel and Oshani (2011) have suggested the need to integrate principles of sustainability in EIA and SIA in order to achieve long-term sustainable development goals. Incorporating environment and social considerations in policies, plans, and programs through strategic environment assessment (ST1) and climate change considerations (GHG emission from project and climate change impact on project) (ST2) during EIA should be included as one of the strategies to consider the long-term impact of the project on surrounding environment and community. The adoption of environmental-friendly and green design technique (ST3) such as (e.g. LEED, CEEQUAL, and BREEAM) in the design of PPPs could serve as an effective tool for contribution towards biodiversity conservation. Also, UNECE (2008) mentioned that the early participation of financial institutions (ST4) through adoption of the equator principles during PPP development phase would be useful for determining, assessing, and managing environmental and social impacts. The inclusion of ST1 and ST2 strategies in EIA and SIA and adoption of ST3 and ST4 strategies along with EIA and SIA will help in improving the sustainability of EIA and SIA by fulfilling the requirements of principles ‘socio-ecological system integrity’ and ‘resource maintenance and efficiency’.

The WLC methodology and risk model used in VfM analysis of PPP projects fail to promote accomplishment of sustainable development principles. Hill and Collins (2004) have suggested to integrate the elements of social and environment dimensions for sustainability in WLC and risk model of VfM analysis in order to improve the suitability filter model, which is used to assess whether PPP is the suitable route for procuring the project or not. The WLC methodology can be improved through adoption of green accounting principles wherein E&S cost and benefits are included in the cost model (ST5). Similarly, the risk model of VfM analysis can also be modified through inclusion of climate change parameters and long term E&S impact of the projects (ST6). Furthermore, strategy for improving sustainability should aim to adopting a LCA approach using materials calculator to quantify and compare materials lifecycle impacts, and give emphasis on the need to use materials with environmental labels (ST7). In addition to these

strategies, engagement of independent assessor with the knowledge of sustainability requirement (ST8) would be helpful to assess or check the VfM estimation relating to achievement of sustainability goals. Incorporation of strategies ST5 and ST6 in VfM analysis and adoption of strategy ST7 and ST8 could improve sustainability of VfM analysis from the perspective of 'resource maintenance and efficiency' and 'socio-ecological system integrity'.

The bid evaluation criteria need to be modified to include environment and social dimensions of sustainable development. Samuel and Oshani (2011) and Hill and Collins (2004) suggested that the bidding process should embed environment and social safeguards/dimensions in their tender evaluation, supplier selection, and monitoring functions. Incorporation of environment and social criteria in the bid evaluation (ST9) will enable decision makers to assess the environment and social impacts of the project at the concessionaire selection stage. Similarly, an additional bid criteria to promote utilization of energy efficient systems and various management techniques (ST10) such as lean construction to minimize construction and operation and maintenance-related wastes could also be considered as one of the strategies for promoting sustainability of PPP procurement process. In addition to this, enhancement of procurement policy through promotion of green procurement (ST11) will encourage submission of bids that use innovative technologies to reduce pollution, climate change mitigation, and recycle of waste. Inclusion of these three strategies (ST9, ST10, and ST11) will improve the bid evaluation process and help to promote sustainability of PPP projects through fulfilment of the requirements of 'resource maintenance and efficiency' and 'socio-ecological system integrity' principles.

The government has not provided right set of incentive for the private sector to use energy-efficient systems to minimize environmental pollution and promote sustainable solution for development of PPP projects. Samuel and Oshani (2011) have mentioned that the government should provide various types of incentives to private sector for implementing advance technologies and materials for achieving the sustainable goal during the development of PPPs. USDOT (2007) suggested that introducing incentives for adaption and mitigation of climate change strategies (ST25) during PPP development would be useful in reducing emission of greenhouse gases (GHGs) and promote sustainable solution for reducing pollution effects. Similarly, WEF (2013) proposed that the public sector should provide incentives and subsidies to private sector for considering design features

and construction materials through promotion of usage of renewable and biological materials (ST26) that will generate optimum whole life costs across the life of the contract. Along with these incentive mechanisms, the public sector should introduce market mechanisms (ST27) for maximizing benefits or minimizing costs to develop their own solutions and responses to the various environmental problems during development of PPPs. Furthermore, the strategy of establishing a law regarding liability and compensation (ST28) to those persons who are creating the pollution and who are adversely affected by pollution would act as a better incentive to private sector to control environment and social impacts. Inclusion of these two incentive mechanisms (ST25 and ST26) along with market mechanism (ST27) and law regarding liability and compensation (ST28) would help in fulfilling the goal of 'resource maintenance and efficiency' and 'socio-ecological system integrity' principles of sustainability.

Incorporation of 'intra-generational equity' and 'livelihood sufficiency and opportunity' in design of user's charges, and bidding and transaction cost

Higher tariff charges for infrastructure services provided through PPP will make a certain section of the society inaccessible to the infrastructure services. In order to enhance the social sustainability of PPP projects, there is a need to promote users' participation by conducting comprehensive communication program, and willingness surveys (USDOT, 2007). UNECE (2008) has suggested that to implement institute differentiated rates mechanism (ST12), wherein user charges adjust according to time, location, and usage. Another strategy is to modify the viability gap funding (VGF) mechanism (ST13), which is currently limited to 40 per cent of the total project cost. In country like India with lower demand growth prospects in certain infrastructure sectors (i.e. waste water and solid waste), a higher VGF may be necessary. Comprehensive communication program should also be arranged to educate the users about the necessity of improved services, as the new service saves their time and cost. This is called as awareness through value analysis (ST14). Inclusion of these strategies (ST12, ST13, and ST14) will makes the under-privileged section of the society accessible to the infrastructure services and will help to fulfill the sustainable development principles 'intra-generational equity' and 'livelihood sufficiency and opportunity'.

The bidding and transaction cost of PPP procurement is costlier than traditional procurement practice due to lengthy negotiation and enlistment of various professional

services in the transaction. Parker and Hartley (2003) have suggested a strategy (ST15) that introduces the concept of trust and reputation of relational contracting (RC) in PPP procurement in order to minimize procurement transaction costs through integration of RC principles in PPP contract. Similarly, Mahalingam (2010) has suggested another strategy (ST16) where in private sector is given adequate flexibility for preparation of an entire master plan of the project so that it promotes innovative and competitive bids. Interacting effectively with bidders during tender process, consistent with appropriate probity arrangements through probity advisors (ST17) could also help in reducing the transaction, and bidding cost. Incorporation of these strategies (ST15, ST16, and ST17) will be amongst the effective tools to minimize the transaction and bidding cost and will help to fulfill the sustainable development principles 'intra-generational equity' and 'livelihood sufficiency and opportunity'.

Integration of 'socio-ecological civility and democratic governance' in stakeholder's participation and maintaining transparency and accountability of bidding

Public opposition has been reported as one of the main reasons for failure of PPP projects in several instances. Stakeholders and users' participation need to be promoted to enhance social sustainability of PPP projects (USDOT, 2007). Strategy to establish a special purpose company, jointly owned by the government, users, and private developers (ST18) and strategy for establishing partnering with urban local bodies (ULB) or NGOs (ST19) could play a key role in convincing the community about the benefits of PPP project. Another strategy is to adopt building information modeling (BIM) system (ST20) as a tool for communication with stakeholders to promote participation in decision making, resulting in greater clarity of the project to all the stakeholders across the project lifecycle. Inclusion of these strategies (ST18, ST19, and ST20) will fulfill the prerequisites of sustainable development principle 'socio-ecological civility and democratic governance' and will help in wider stakeholder's participation in PPP project development.

There are various complaints from private sectors that the government fails to maintain transparency and accountability during bidding process, thereby failing to accomplish the goals of 'socio-ecological civility and democratic governance' principle of sustainability. To improve transparency and accountability, public sector should include a 'strategic communication plan' (ST29) as a part of policy that explains the benefits of the program and can prevent the discussion from being defined by PPP critics, within the media and

elsewhere. Similarly, the appointing of ‘institutional body’ (ST30) would effectively improve the accountability of public sector through independent scrutiny of bidding process. Also, appointment of ‘fairness and process auditors’ as a third party independent experts (ST31) will provide a level of assurance to government sponsors, bidders and the public and will make the bidding process fair, equitable, and appropriate. Incorporation of these strategies (ST29, ST30, and ST31) will fulfill the prerequisite of sustainable development principle ‘socio-ecological civility and democratic governance’ and will help in enhancing transparency and accountability during bidding process.

Integration of ‘socio-ecological civility and democratic governance’ in goal conflicts management, and skill and knowledge development of public and private sector

Conflict of goals between the private sector and government sector is an important issue that should be taken care of by government to achieve the socio-ecological civility and democratic governance goals of sustainability. Samuel and Oshani (2012) have suggested that PPPs should embed environmental and social safeguards in their goals, designs and specifications. Mahalingam (2009) have suggested that early participation of private sector through articulation of policy (ST32) could be a better policy to minimize goal conflict between public and private sector during the designing of PPP projects. Establishment of public-private interaction forums during development of PPPs (ST33) can also play an important role in understanding each other better, own their shortcomings, hold open discussions, and work through issues that will be encountered during the course of the project. The inclusion of these strategies (ST32 and ST33) would help in controlling goal conflict between public and private sector throughout life cycle of PPP projects. These strategies will help in fulfilling the prerequisites for ‘socio-ecological civility and democratic governance’ principle of sustainability.

The key officials involved in PPP procurement process normally do not have the requisite skill and knowledge about sustainability concepts and green concepts. Lack of sustainability skill and knowledge could become a major hindrance to accomplishment of the requirement of socio-ecological civility and democratic governance goals of sustainability. Specialized sustainability advisors (ST35) should be appointed in order to assist the contracting authorities in ensuring that sustainability considerations are consistently included in PPPs. The PPP unit should also start establishing national PPP training programs to build the expertise of government officials in the form of practical

‘on-the-job training’ (ST36) in order to enhance their skillset. In addition to these two strategies, educational program (ST37) and awareness rising training program (ST34) that give conscious attention to environmental and social objectives for achievement of sustainable development goal through PPP should also be developed to bring change in attitude amongst the public sector officials. Inclusion of these strategies (ST34, ST35, ST36 and ST37) as a part of procurement preparation will improve the sustainability skill and knowledge of public sector officials, and help in accomplishing the prerequisites for ‘socio-ecological civility and democratic governance’ principle of sustainability.

Inclusion of ‘precautionary and adaptation’ in risk allocation and mitigation

The underlying norms of risk transfer and compensation for PPPs will need to be changed so that it can effectively serve as a tool for sustainable development. The strategy to include renegotiation mechanism (ST21) in MCA could act as an effective tool to address socio-political or economic changes that could not be handled through inflexible contract model (Mahalingam, 2010). Another strategy is to make the current MCA flexible so that it is equipped to address future unforeseen or unpredictable issues (ST22) related with climate change, any disaster, and risks that could be encountered over the project lifecycle. Furthermore, another strategy is to include clauses on cost sharing in case of realization of unusual site risks by public sponsor agency (ST23), such as hazardous materials discovered on project site during construction. In addition to these three strategies, the public sector should provide an additional finance for robust financing structure (ST24), which is based on long term plans with robust business cases, developed and tested over a number of years. Inclusion of these strategies (ST21 to ST24) will help in improving the risk allocation and mitigation mechanism in MCA from the perspective of sustainable development principle ‘precautionary and adaptation’.

5.5 Summary

This chapter established the preliminary framework of strategies to integrate the principle of sustainability into the conceptual areas of PPP procurement process. The proposed framework has based on four levels of principle-based approach: Level 1 - three dimensions of sustainability, Level 2 - core principles of sustainability (Gibson’s principles), Level 3 - guiding principles of sustainability, and Level 4 - strategies to comply the prerequisites of guiding principles. It has been observed from the literature review that

the core principles are abstract and vague statements that often need further descriptions and illustrations to make them more meaningful and useful. To make them more expressive and meaningful, this chapter has explored the guiding principles for sustainable development through literature review of sustainability practices of various engineering organizations involved in infrastructure development. Furthermore, the strategies on how to integrate the principles of sustainability in PPP procurement process had also been identified through literature review on best practices being adopted while implementing PPPs. It has been observed that these strategies will help in fulfilling the sustainability goal of at least one guiding principle. Finally, these strategies were then included in the procurement process using the mapping process so that these strategies will overcome the shortfalls represented the conceptual area of PPP process in order to accomplish the goal of principles of sustainability. The applicability and feasibility of the preliminary framework have been tested through focused interviews with the stakeholders involved in development and implementation of PPPs in the next stage of this study.



CHAPTER 6

DEVELOPMENT OF FINAL FRAMEWORK

6.1 Introduction

This chapter presents the third research stage of the study wherein the feasibility of preliminary framework development in the previous stage of this study had been tested through focused interviews with the stakeholders involved in development and implementation of PPP infrastructure projects of India. The final framework of strategies to enhance the PPP procurement process has been developed through corroboration of primary and secondary evidences. The grounded theory research approach has been selected to develop the final framework from the literature and interview sources.

The chapter has been divided into four sections. The research method and components of the final framework are explained in the second section of the chapter. The procedure of primary data collection using focused interviews is explained in the third section of this chapter. The third section also discusses the qualitative data analysis procedure using various qualitative techniques. The last section discusses the final framework that has been developed for enhancing the sustainability of PPP procurement process

6.2 Method and Components of the Framework

The final framework aims to overcome the shortfalls in PPP procurement process through adaptation of the identified strategies that will help in accomplishment of the sustainable development goals through the guiding principles. The final framework, therefore, comprises of three major components, namely, guiding principles, shortfalls/conceptual areas, and strategies. In this stage, the study aimed at: (i) Evaluating the occurrence of shortfalls/conceptual areas in PPP procurement process; (ii) Evaluating the feasibility of inclusion of strategies in respective conceptual areas of PPP procurement process; and (iii) Evaluating the adequacy of guiding principles to accomplish the goals of sustainable infrastructure development procure through PPPs. To achieve these aims, face-to-face focused interviews had been conducted with the four categories of stakeholders involved in development and implementation of PPP infrastructure projects of India. Then, the grounded theory approach was used to develop the final framework. This approach enables

corroboration of findings on preliminary framework in the form of literature review findings with the focused interview findings.

6.3 Focused Interviews

6.3.1 Data Collection

The targeted respondents selected for the focused interviews were the stakeholders involved in development and implementation of PPP projects in India. They have been categorized into four groups, namely transaction advisors (TAs), officials from government sectors (GSs), officials from financial institutions (FIs), and project managers from private sectors (PSs).

The respondents/experts were selected based on the criteria introduced by Hallowell and Gambatese (2010) and those criteria are Educational qualification, Position in the organizational hierarchy of the firm, and Number of years of experience relating to PPP infrastructure projects in India. Initially, a preliminary list of 54 experts were identified for the interview relating to four categories of stakeholders group through web-based search, but only 33 experts have fulfilled the selection criteria. The preliminary list of experts has been drawn to ensure equal representation of all the four stakeholders in the study. Then, all of them (33 experts) have been contacted either by mail or telephone requesting them to participate in the study. After the preliminary interaction with the 33 experts, 9 experts declined to participate in the study citing personal and official reasons. The interview template was then shared with the remaining 24 experts.

Interview template comprises of three sections. The first section gathers information about qualification and experience of the respondents involved in PPPs development through objective type questions with multiple options to answer each question. The second section has been designed to get the respondents suggestion on the adequacy of principles for sustainable infrastructure development through PPP. The third section has been designed to seek respondents opinion and suggestions on the relevancy of the conceptual areas/shortfalls and feasibility to include the strategies in conceptual areas of PPP procurement process.

In order to assess comprehensiveness of the draft interview template, a pilot study was executed with the local respondents. The main aim of a pilot study is to examine the clarity

of language, appropriateness and logic of questions, layout, the degree of depth, ease of navigation, and user-friendliness of the whole interview template. The pilot study was conducted with six experts (2 public sectors, 2 private sectors and 2 transaction advisors) involved in development of PPP projects in Guwahati region during September 2014. Figure 6.1 summarized the details of respondents participated in a pilot study with three selection criteria. It could be observed from the Figure 6.1 that five out of six respondents have a post-graduate degree (i.e. higher qualification). Four respondents are holding a top-level managerial position in their organizations while remaining two respondents is a middle-level management executive. All respondents have more than five years of experience while three of them have more than fifteen years of experience in PPP projects development. The two strategies from 37 strategies (identified from literature) were merged with the similar objectives of another two strategies as per the suggestions from pilot study respondents. Therefore, the remaining 35 strategies were selected for final interviews (main study) with remaining 18 respondents. After successful completion of a pilot study, suggestions from experts were incorporated in the final interview template.

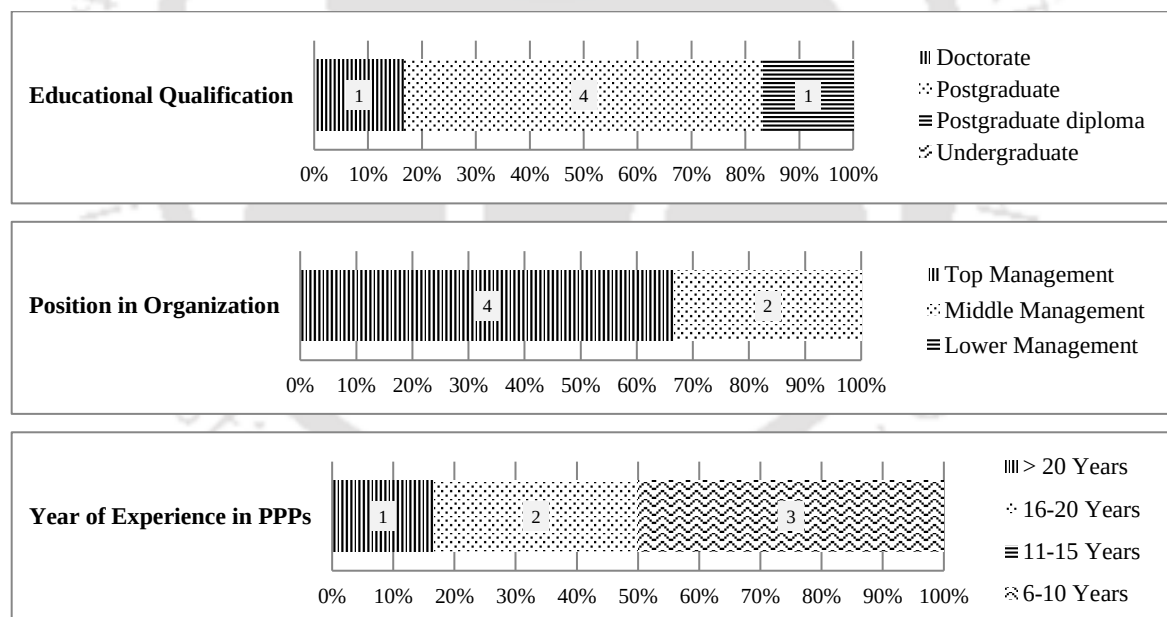


Figure 6.1: Demographic information of respondents for pilot study

The suggestions from pilot study were incorporated in the final interview template that has been used for final interviews (main study) with 18 experts from the rest of the country. The interview template used for the final interviews is provided in Appendix 1. The final interviews with 18 respondents for main study were conducted during the period November 2014 to January 2015. The responses from 18 interviews were selected for the

qualitative analysis. The 18 respondents, who had participated in the interviews for main study, have experience in various kinds of PPP infrastructure projects and worked throughout India. The distribution of experts in accordance with the selection criteria is summarized as a bar chart in Figure 6.2. The group of respondents includes 3 respondents from financial institutions, 4 from government sector, 5 from private sector, and 6 respondents were transaction advisors. The list of 18 respondents with designation and details of working sector is attached in Appendix 2. It could be observed from Figure 6.2 that most of the respondents possessed higher education degrees - 89% of the respondents have either postgraduate degree, postgraduate diploma, or doctorate degree (i.e. higher qualification). 95% respondents are holding middle (44%) and top (50%) level managerial positions in their organizations while the remaining 6% respondents are working at lower management level. The experiences of the most of the respondents have been more than five years, while only 6% respondents have less than five years of experience in PPP project development.

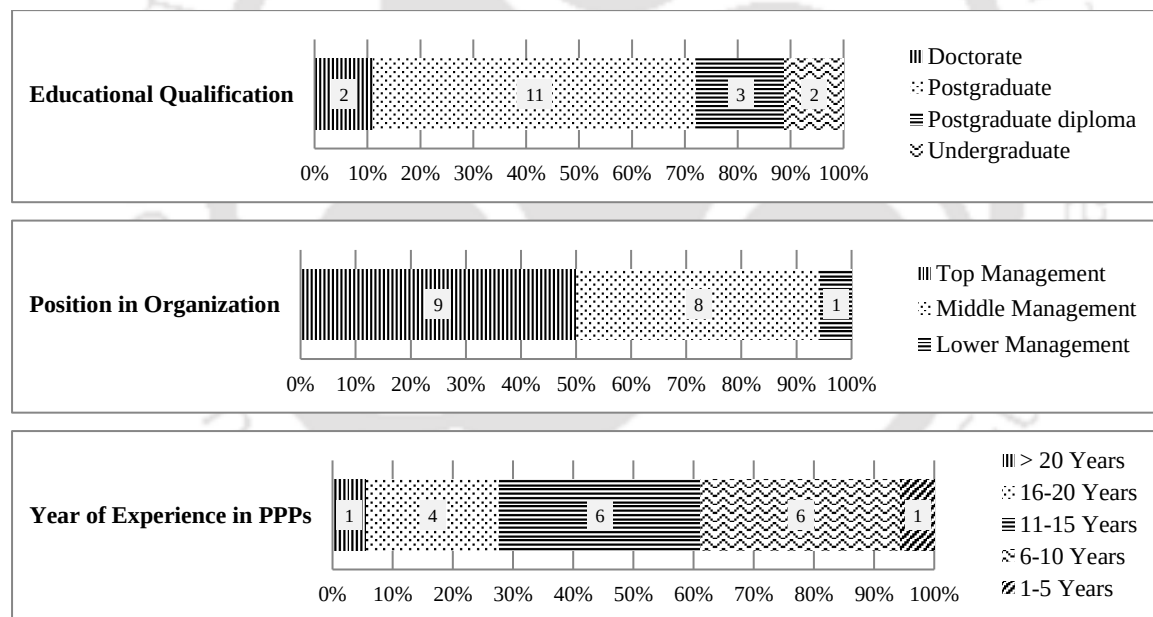


Figure 6.2: Demographic information of respondents for main study

6.3.2 Data Analysis

The responses from the interviewees were coded through two cycles of coding using the provisional lists of codes derived from the preliminary framework. The provisional codes relate to guiding principles, shortfalls, and strategies. The respondents' suggestion on each guiding principle were, then, coded as free node through open coding. In the similar

manner, respondents' suggestion on the shortfalls and strategies were also coded as free node through open coding. The coded data were then analyzed using the four qualitative techniques -classical content analysis, constant comparison analysis, componential (matrix query) analysis, and taxonomic (model) analysis - for drawing the conclusions. Table 6.1 summarized the qualitative techniques used for drawing of conclusions from guiding principles, and shortfalls and strategies.

Table 6.1: Techniques used for drawing of conclusions from interview data

Sl. No.	Data or Parameter	Analysis techniques in NVivo10 for drawing of conclusions
1.	Guiding principles	Classical content analysis & Componential analysis (Matrix query)
2.	Shortfalls and Strategies	Classical content analysis; Componential analysis (Matrix query) Taxonomic analysis (Models); and Constant comparison analysis

For the guiding principles, classical content analysis was carried using NVivo10 to count the number of respondents coded under each respective guiding principle. It has been observed from classical content analysis that the minimum number of respondents coded against the principles have been observed to be 17 respondents (refer Table 6.2).

Table 6.2: Classical content analysis of interview data for guiding principles

Sl. No.	Guiding Principles	Sources/Respondents
1	Environmental protection	18
2	Polluters pay	18
3	Balance risk allocation	18
4	Adaptability and resilience	17
5	Precautionary	18
6	Quality of life	18
7	Creativity and promote innovation	18
8	Up-gradation of knowledge	17
9	Affordable user charges	17
10	Intra-generational equity	18
11	Intergenerational equity	17
12	Long term strategic planning	18
13	Maintenance of natural resources	18
14	Value for money	18
15	Efficient project delivery	18
16	Public participation	18
17	Transparency and accountability	18
18	Strong organization and leadership	17
19	Multidimensional	18
20	Continuum	18

Componential analysis using matrix query was, then, conducted to check the respondents' coding similarity for various guiding principles. The result of the matrix query for guiding principles across various respondents' coded is shown in Figure 6.3. It could be observed that almost all the four groups of respondents have coded all the guiding principles.

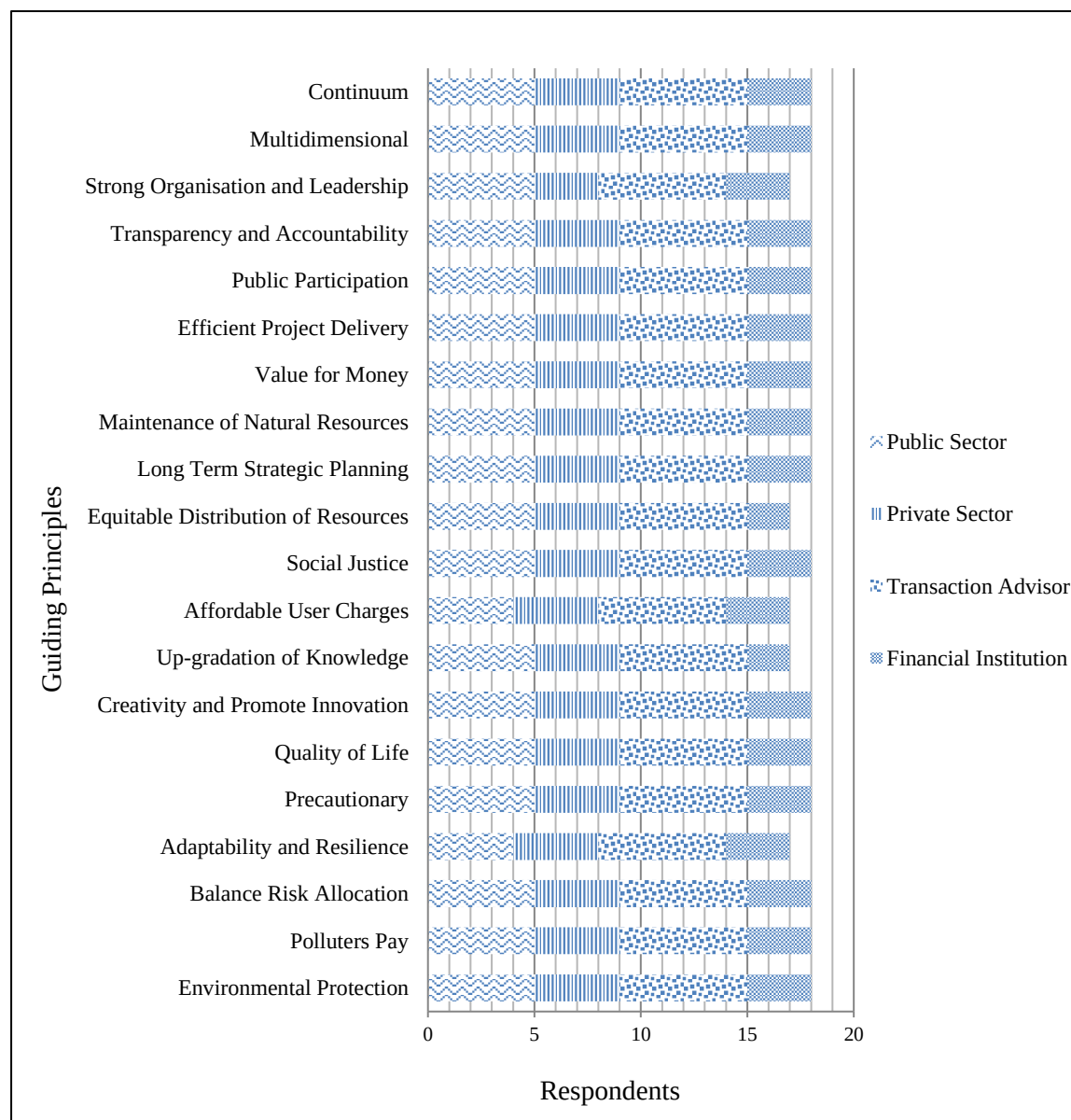


Figure 6.3: Result of matrix query for guiding principles vs. respondents

With respect to shortfalls and strategies, constant comparison analysis was carried out to identify the underlying themes. Then, classical content analysis to count the number of respondents coded against each shortfall and strategy. The results of the classical content analysis (CCA) are shown in Table 6.7, showing the number of respondents coded for each strategy and shortfall. It has been observed from the classical content analysis that the maximum of respondents coded against any of the shortfall and strategy has been 15

respondents. Finally, componential analysis using matrix query was carried out to check coding similarity for shortfalls and strategies amongst the respondents' group. Figure 6.4 and 6.5 shows the results of matrix query for coding of shortfalls vs. respondents and strategies vs. respondents respectively. It has been observed from this analysis that the almost all the four groups of respondents have coded similarly for all the shortfalls and strategies.

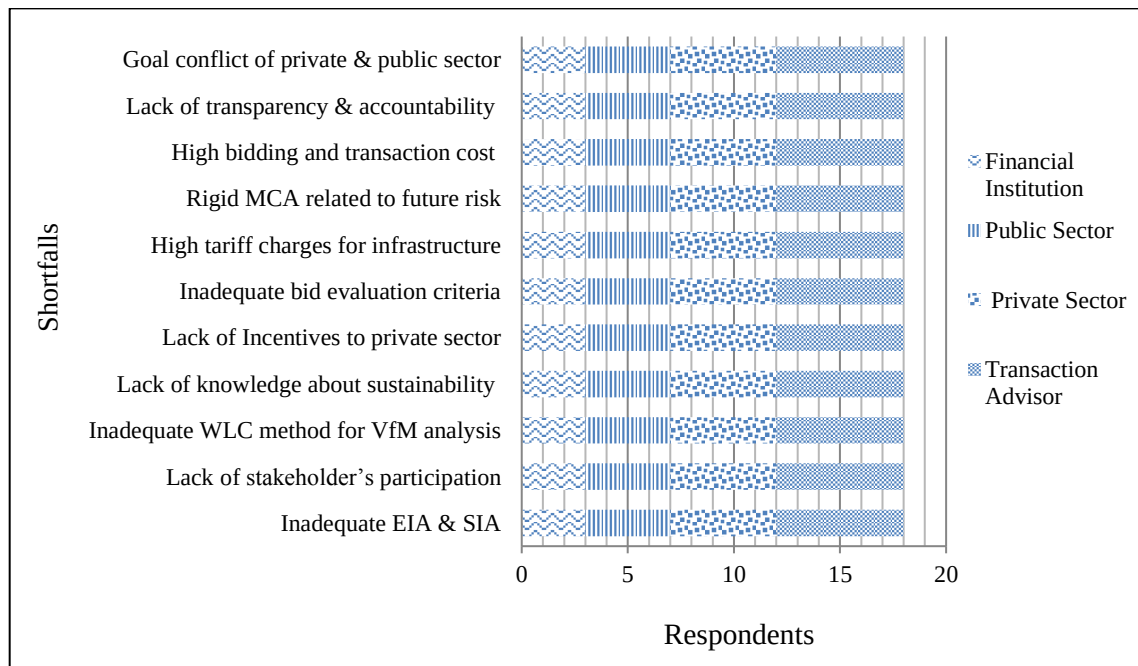


Figure 6.4: Result of matrix query for shortfalls vs. respondents

Taxonomic analysis has also been undertaken as part of the qualitative analysis to define the relationship between the variables and represent the relationship in the form of a model. In this study, taxonomic analysis has been carried out in NVivo10. The model that has been developed from taxonomic analysis shows the relationship between the various strategies and the respective activities (includes shortfalls) and deliverables of PPP process. Figure 6.6 shows the detailed model of the framework of strategies, shortfalls, and deliverables of PPP procurement process. In this Figure 6.6, a 'vertically elongated rectangle' represents as a 'strategies'; an octagon represents the 'shortfall'; and a 'horizontally elongated rectangle' represents the 'deliverables'. The alphabetic and numerical codes are used to define variables in the model. The alphabetic code 'A to E' for deliverables, numerical codes '1 to 11' for shortfalls and numerical codes '1.1, 1.2...11.3' for strategies are used for model development in Figure 6.6. It could be observed from the model that all the variables are inter-related with each other.

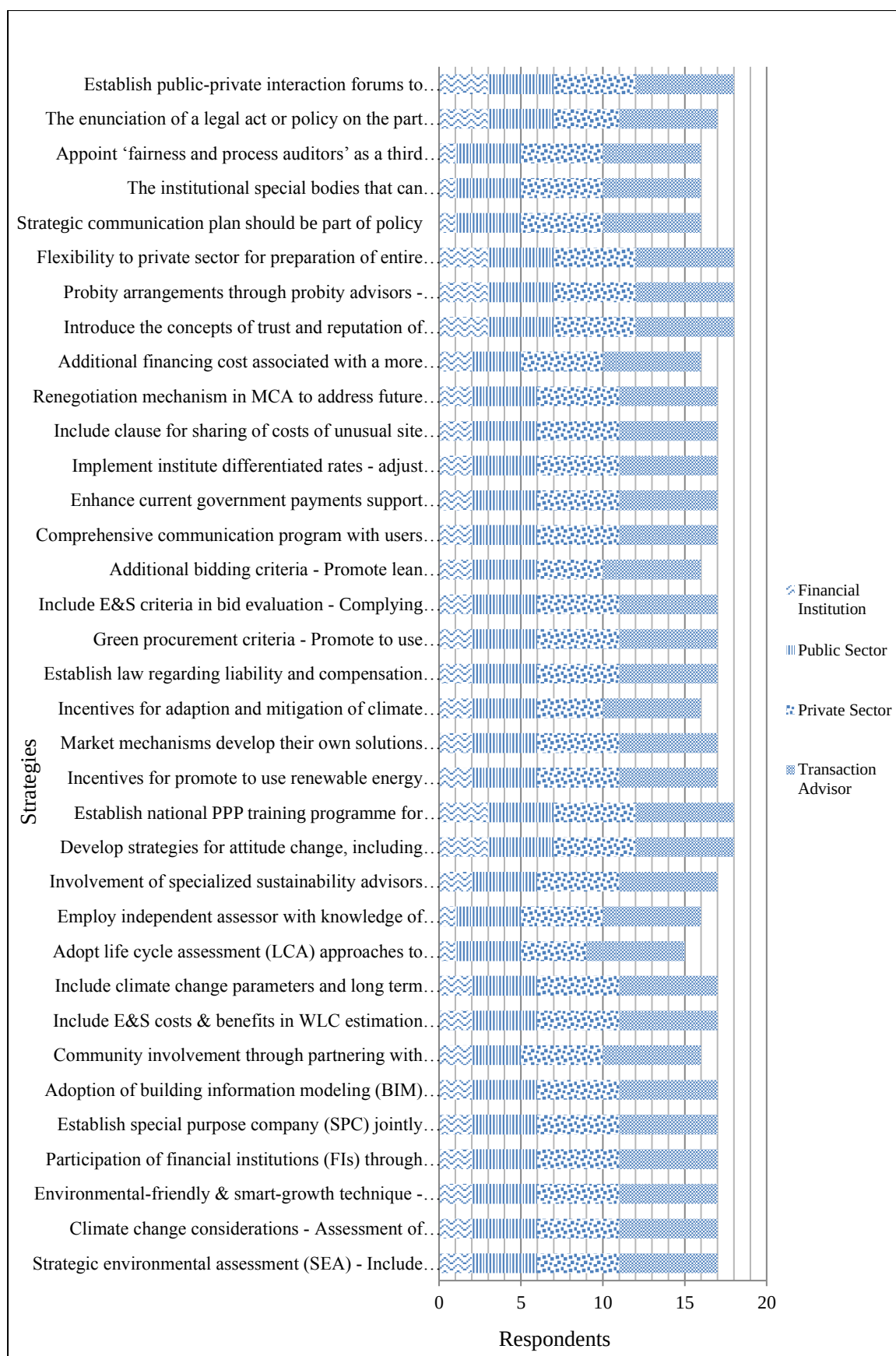


Figure 6.5: Result of matrix query for strategies vs. respondents

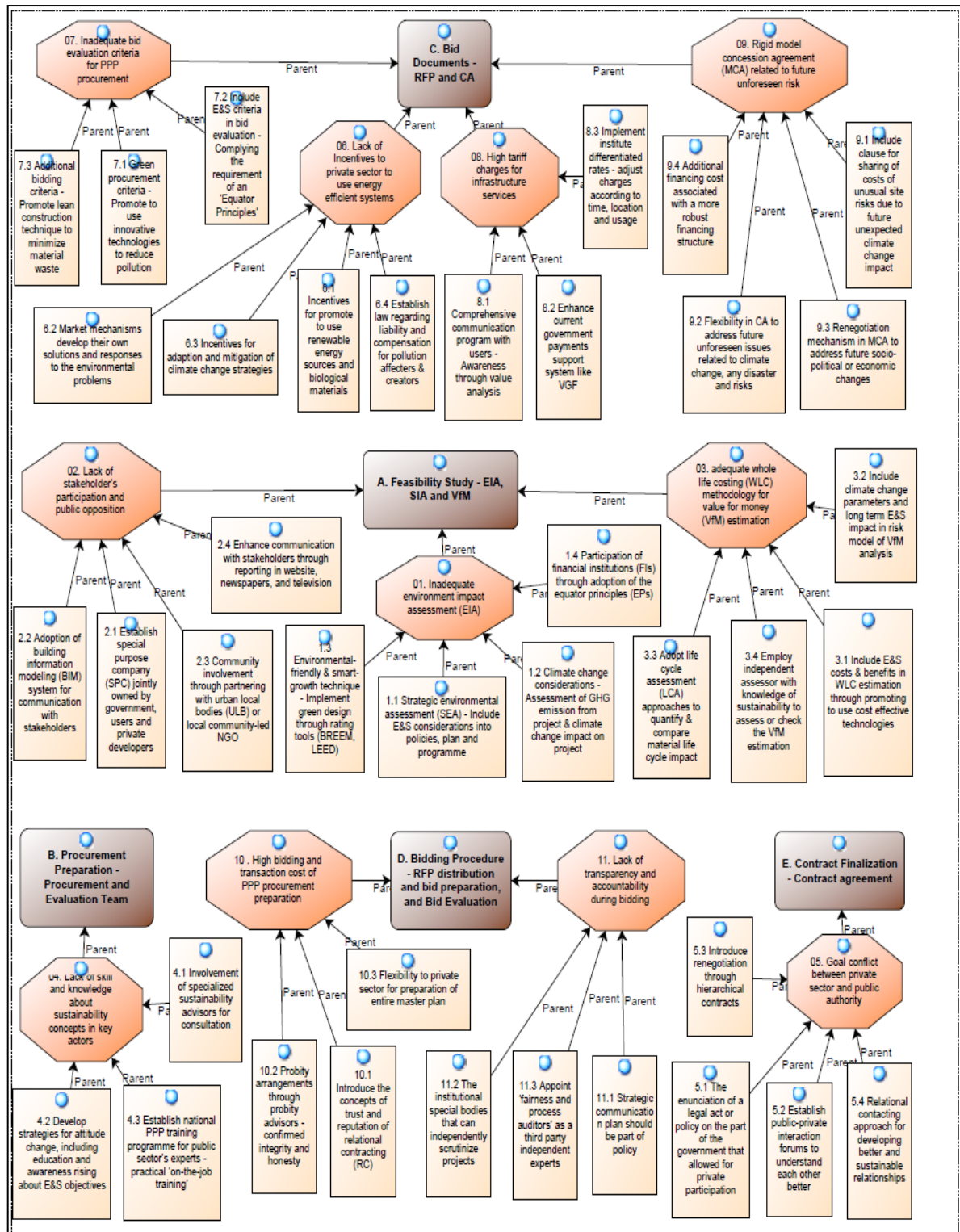


Figure 6.6: Model for strategies, shortfalls and deliverable of PPP process

The qualitative analysis of the focused interviews findings concluded with the final tactics of confirming the findings. Miles et al. (2013) suggested two tactics for confirming the findings i.e. ‘looking for negative evidence’ and ‘ruling out spurious relations’. The micro-interlocutor analysis is one of the techniques that has used for ‘looking for negative

evidence’ and the conclusion verified using a rating scale. The confirmations of the respondents’ views on guiding principles, shortfalls and strategies have been done through checking of consensus and dissent view of each respondent on each parameter. Onwuegbuzie et al. (2009) have suggested that qualitative data gathered through ‘talk’ (interview) could be better analyzed through ‘micro-interlocutor analysis’, wherein the consensus of the respondents is displayed in the form of a matrix. For this analysis, the matrix has been used to identify the negative evidence coded by respondent for each guiding principles, shortfall, and strategies. The matrix is constructed with respondents in the column, and guiding principles/ shortfalls/strategies in a row. The five-point scale shown in Table 6.3 was used to score the eighteen respondents’ view on the degree to which a particular shortfall was present or will affect the sustainability of PPP procurement process; degree to which particular strategies will be able to enhance respective shortfall; and degree to which particular guiding principles will be adequate to achieve the sustainable infrastructure goals through PPPs. Table 6.4 to 6.6 shows the matrices indicating how many respondents have provided a substantive statement indicating agreement or disagreement with the adequacy of guiding principle, feasibility to include strategies, and occurrence of shortfalls in PPP process respectively. The overall score on the consensus of all the respondents’ view points on each parameter has been calculated as a mean value of all respondent’s score by using above mentioned five-point scale. The mean value of each parameter is provided in the last column of the matrix as an overall score. It could be observed from the overall score for each parameter that the respondents have agreed on the feasibility to inclusion of the strategies in conceptual areas of PPP procurement process except one strategy rated as disagreement (‘early participation of financial institutions’) and except one shortfall rated as neutral (‘lack of transparency and accountability’). Also, the respondents have shown their agreements on the adequacy of guiding principle for achieving of sustainable infrastructure development goals for PPPs.

Table 6.3: Five point scale for scoring of guiding principles, shortfalls, and strategies

Score	Strength	Description
1	-- (double minus)	Strongly disagree
2	- (single minus)	Disagree
3	+ - (plus minus)	Neutral
4	+ (single plus)	Agreed
5	++ (double plus)	Strongly agreed

Table 6.4: Matrix for assessing level of consensus amongst respondents on adequacy of guiding principles

Sl. No.	Respondents	Financial Institution (FI)			Government Sector (GS)				Private Sector (PS)					Transaction Advisor's (TA)						Mean
		FI1	FI2	FI3	GS1	GS2	GS3	GS4	PS1	PS2	PS3	PS4	PS5	TA1	TA2	TA3	TA4	TA5	TA6	
	Guiding Principles																			
1.	Environmental protection	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
2.	Polluters pay	++	+	+	+	+	+	+	+	+	+	+	+	++	+	+	+	++	+	+
3.	Balance risk allocation	+	+	+	+	+	+	+	+	+	+	+	+	++	+	+	++	+	+	+
4.	Adaptability and resilience	+	+	+	+	+	+	+	+	+	+	+	+	++	+	+	+	+	+	+
5.	Precautionary	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
6.	Quality of life	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	++	+	+
7.	Creativity & innovation	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	++	+
8.	Up gradation of knowledge	+	+	—	+	+	+	+	+	+	+	+	+	+	+	++	+	++	++	+
9.	Affordable user charges	+	+	+	+	—	+	+	++	+	+	+	+	+	+	+	+	+	++	+
10.	Social justice	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	++	+
11.	Equitable resources allocation	+	+	—	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
12.	Long term strategic planning	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
13.	Maintain natural resources	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
14.	Value for money	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	++	+
15.	Efficient project delivery	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
16.	Public participation	+	+	+	+	+	+	+	++	+	+	++	+	+	+	+	+	+	++	+
17.	Accountability	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
18.	Strong leadership	+	++	+	+	+	++	+	—	+	+	++	+	++	+	+	+	+	+	+
19.	Multidimensional	+	+	+	+	+	+	+	+	+	+	+	+	+	++	+	+	+	+	+
20.	Continuum	+	+	+	+	+	+	+	+	+	+	++	+	+	+	+	+	+	+	+

Table 6.5: Matrix for assessing level of consensus amongst respondents on feasibility of strategies

Sl. No.	Strategies to enhance PPP procurement process	Interview Respondent																		Mean
		F1	F2	F3	G1	G2	G3	G4	P1	P2	P3	P4	P5	T1	T2	T3	T4	T5	T6	
1.	Strategic environmental assessment (SEA)	++	+-	+	+	-	+-	++	++	++	+	+-	++	+	++	++	+-	+	+	++
2.	Climate change (CC) considerations	+	+-	+	+	+-	++	+	+	++	++	++	+-	++	++	+	+-	+	++	++
3.	Environmental-friendly & smart-growth technique	++	+-	+	+	+	++	++	+	++	+	+	++	++	++	+	++	++	++	++
4.	Early participation of financial institutions	--	+-	-	--	--	+-	+-	--	++	+	--	--	++	++	+	--	+	--	--
5.	Establish special purpose company (SPC)	+	-	+-	+	--	++	+	--	++	+	--	++	+-	+-	+	+-	+	--	+
6.	Adoption of building information modeling (BIM)	+	-	+-	+	--	+	--	+	++	+	--	+	+	+	+	-	+	--	+
7.	Partnering with ULBs or local community-led NGO	+	-	+-	+	+	+	+	++	+	+	--	+	+	+	+	++	+	+-	+
8.	Include E&S costs & benefits in WLC estimation of VfM	+	+-	+	+	++	++	+	++	++	++	++	+	++	+	+	--	+	++	++
9.	Include long term E&S impact in risk model of VfM	+	+-	+	+	++	++	+	+	++	+	++	+	++	-	+	+	+	--	+
10.	Adopt life cycle assessment (LCA) approaches	+	+-	+-	+	+	+	+	+	+	+-	+	--	+	+	+	++	+	++	+
11.	Employ independent assessor -knowledge of sustainability	++	+-	+-	+	++	++	++	++	++	+	+	+	+	++	+	++	++	+-	++
12.	Service of specialized sustainability advisors for consultation	+	+-	--	+	-	++	+	++	++	+	+	+	++	+	+	-	+	++	+
13.	Arrange workshops on attitude change for E&S objectives	+	++	+	+	++	++	++	++	++	+	++	++	+	+	+	++	+	++	++
14.	Establish practical 'on-the-job training' program	++	++	+	++	++	++	++	++	++	+	++	--	+	+	++	++	+	++	++
15.	Enunciation of a legal act to allow private participation	+	++	++	+	++	++	++	+-	++	+	++	+	+	+	+	--	+	++	++
16.	Establish public-private interaction forums	+	++	++	+	+	++	++	++	++	+	++	++	+	+	+	--	+	++	++
17.	Incentives for promote to use sustainable materials	++	+-	+	+	+	++	++	++	++	+	--	--	++	++	+	+-	+	++	++
18.	Market mechanisms to develop their own solutions	++	+-	+	+	+	--	++	++	++	+	++	++	+	++	+	-	+	+-	++
19.	Incentives for adaption/mitigation of CC change strategies	++	+-	+	+	+	++	--	+-	++	+	++	++	+	++	+	-	+	++	++
20.	Law for liability/compensation to pollution affecters/creators	+	+-	+	+	++	++	++	--	++	+	++	++	+	++	+	++	+	++	++
21.	Green procurement criteria to use innovative technologies	+	-	+-	+	++	++	+	++	++	+	++	++	+	+	+	-	+	++	++
22.	Include E&S criteria in bid evaluation	--	++	+-	--	++	++	++	--	++	+	--	++	+	++	+	-	+	++	++
23.	Additional bidding criteria to promote lean construction	+	++	+-	--	++	++	++	+-	++	+	++	+	+	++	+	-	+	--	++
24.	Comprehensive communication program with users	+	++	+-	++	++	++	++	++	++	+	--	+	+	+	+	++	+	+	++
25.	Enhance government payments support system like VGF	+	++	+-	++	++	+	++	--	++	+	+-	+	+	++	+-	-	+	--	++

Contd.

Table 6.5 (Contd.)

Sl. No.	Strategies to enhance PPP procurement process	Interview Respondent																		Mean
		F1	F2	F3	G1	G2	G3	G4	P1	P2	P3	P4	P5	T1	T2	T3	T4	T5	T6	
26.	Implement institute differentiated rates to adjust charges	+	++	+-	+	++	++	++	++	++	+	--	+	+	+	+	--	+	+	+
27.	Include clause for sharing of costs of unusual site risks	++	--	+-	+	++	++	+	++	++	+	--	+	++	++	+	-	+	++	++
28.	Renegotiation mechanism to address future impacts	++	++	+-	--	++	++	++	++	++	+	--	+	+	+	+	-	+	--	++
29.	Additional financing cost with a more robust financing	+	++	+-	+	+-	++	+	++	++	+	--	--	+	+	+	-	+	-	+
30.	Introduce the relational contracting (RC)	++	--	--	++	--	+-	++	++	++	+	--	++	+	++	+	+-	+	--	++
31.	Probity arrangements through probity advisors	+	+-	+-	++	--	--	+	++	++	+	--	++	--	+	+	-	+	++	+
32.	Flexibility to private sector for preparation of master plan	++	--	--	++	--	++	++	++	++	+	++	+	++	++	+	-	++	+	++
33.	Strategic communication plan should be part of policy	+	+-	+-	+	+	+	++	++	++	+	++	+	+	+	+	--	+	+-	+
34.	Institutional special bodies to scrutinize projects	++	+-	+-	++	++	+	++	--	++	+	-	+	+	+	+	--	+	+-	+
35.	Appoint 'fairness and process auditors' as a experts	+	+-	+-	-	--	++	+	--	++	+	--	++	+	++	+	-	+	++	+

Table 6.6: Matrix for assessing level of consensus amongst respondents on presence of shortfalls

Sl. No.	Shortfalls in PPP Procurement Process	Interview Respondents																		Mean
		F1	F2	F3	G1	G2	G3	G4	P1	P2	P3	P4	P5	T1	T2	T3	T4	T5	T6	
1.	Inadequate EIA and SIA	++	--	+	++	++	++	+	++	+	+	+	+	+	+	++	+-	+	++	+
2.	Lack of stakeholder's participation	+	++	++	++	++	+	+	++	++	+	++	+	++	+	+	+-	+	++	++
3.	Inadequate WLC in VfM estimation	+	++	++	++	++	++	+	++	+	+-	+	++	++	++	+	+	+	+	++
4.	Lack of knowledge about sustainability	+	++	++	++	+-	++	+	++	++	+	++	++	+	+	+	-	+	+	+
5.	Goal conflict between private and public sector	+	++	--	++	--	++	++	++	++	+	+	++	++	++	+	--	+	+	+
6.	Lack of Incentives to private sector	++	++	+	++	+	++	++	++	+	+	++	+-	+	++	+	--	+	+	++
7.	Inadequate bid evaluation criteria	+	--	+-	+-	++	-	++	++	++	+	+-	++	++	+	++	--	+	+-	+
8.	High user charges for services	+	+-	--	++	+	++	++	++	++	-	+-	--	++	+	++	+-	++	++	+
9.	Lack of risk allocation and mitigation	+	++	+-	++	++	++	+	++	++	+	++	++	+	++	+	+-	++	+-	+
10.	High bidding and transaction cost	+	++	+-	+-	+	++	+	++	++	+	--	+	+	+	++	--	+	+	+
11.	Lack of transparency and accountability	+	-	--	+-	--	+-	+	+-	++	+	+-	++	++	+	++	-	+	+-	+-

6.4 Discussion on the Final Framework

The final framework presents the strategies that should be adopted for improving the PPP procurement process from sustainability perspective, categorized under eleven conceptual areas (Summarized in Table 6.7). The conceptual areas are Environmental and social impact assessment; Stakeholders' participation; Value for money analysis; Skill and knowledge of sustainability concepts; Incentives to private sector; Bid preparation and evaluation; User charges for infrastructure services; Risk allocation and mitigation; Bidding and transaction cost; Transparency and accountability during bidding; and Relationship of public and private sector. Discussion on these strategies is presented in this section on a theme wise basis.

Table 6.7: Framework of strategies to enhance the sustainability of PPP process

Conceptual Areas (Axial code /Tree node) [1]	Strategies to be included in conceptual Areas for enhancing the sustainability of PPP procurement process (Open code/Free node) [2]	Results of CCA [3]	Results of MIA [4]
	Environmental and social impact assessment	18	+
	Strategic environmental assessment	17	++
	Climate change considerations into EIA	17	++
	Environmental-friendly and smart-growth technique	17	++
	Stakeholders and local public participation	18	++
	SPC: Jointly owned by government, users and developer	17	+
	Building information modeling	17	+
	Community involvement through partnering	16	+
	Whole life-cycle costing for VfM analysis	17	++
	Environmental & social (E&S) costs & benefits in WLC estimation	17	++
	Climate change parameters & long term E&S impact in risk model	17	+
	Life cycle assessment approach using material calculator	15	+
	Independent assessor for auditing of VfM estimation	16	++
	Skill and Knowledge of sustainability concepts	18	+
	Specialized sustainability strategic advisor for consultation	17	+
	Training & awareness with perspective of E&S goals	18	++
	National PPP programs includes 'on-the-job training'	18	++

Contd.

Table 6.7 (Contd.)

Conceptual Areas (Axial code /Tree node) [1]	Strategies to be included in conceptual Areas for enhancing the sustainability of PPP procurement process (Open code/Free node) [2]	Results of CCA [3]	Results of MIA [4]
	Incentives for private sector to promote sustainability	18	+
	Incentives to use renewable energy sources & biological materials	17	++
	Market mechanisms to develop their own solutions on E&S issues	17	++
	Incentives for adaption and mitigation of climate change strategies	16	++
	Law regarding liability and compensation on environmental issues	17	++
	Bid evaluation criteria	18	+
	Green procurement to invite innovative bid	17	++
	Environmental and social criteria in bid evaluation	17	++
	Additional bidding criteria: lean construction	16	++
	User charges for infrastructure services	18	+
	Comprehensive communication programs through value analysis	17	++
	Modified viability gap funding (VGF) mechanism	17	++
	Institute differentiated rates mechanism	17	+
	Risk allocation & mitigation	18	+
	Clauses to share a cost for future climate change impact	17	++
	Renegotiation mechanism to address socio-political changes	17	++
	Provision for additional finance for robust financing structure	16	+
	Bidding and transaction cost	18	+
	Establish the aspects of trust & reputation of relational contracting	18	++
	Probity arrangements to confirm integrity through probity advisor	18	+
	Flexibility to private sector for preparation of entire master plan	18	++
	Transparency and accountability during bidding	18	+ -
	Strategic communication plan as a part of procurement policy	16	+
	Institutional bodies that can independently scrutinize projects	16	+
	Appoint fairness & process auditors as a 3 rd party expert	16	+
	Relationship of public and private sector	18	+
	Enunciation of a legal act to allow early private participation	17	++
	Establish the public-private interaction forums	18	++

6.4.1 Environmental and social impact assessment

In the current PPP procurement process, EIA is a part of the feasibility study to minimize the impact of the project on surrounding environment and society. However, the experts have expressed the opinion that EIA has focused only on ensuring that project impacts are within the acceptable limits without giving due importance to optimizing the project for

the environment, social and community benefits. The EIA and SIA, as per the respondents, therefore needs to be an in-depth study so that it can provide an elaborate input on design and operation aspects of the project.

Strategic environmental assessment (SEA)

Adopting SEA will ensure consideration of environmental issues from the beginning of the decision-making process and can help to detect potential environmental impacts at an early stage, even before the initiation of design of the projects. And, SEA should be conducted with quantifiable set of parameters. Incorporating SEA in prefeasibility study of PPP projects will help to take into account the long term impacts of infrastructure development in the early stage of the procurement process and will help in enhancing the sustainability aspect.

Climate change considerations in EIA

The private entity in a PPP project has accessed to new technologies and they should be encouraged to provide innovative solutions to achieve the goal of greenhouse gases emissions reduction/avoidance. In order to take advantage of this, government should give emphasis on assessment of climate change consideration along with or as a part of EIA during the pre-feasibility study of PPP identification stage, while the mitigation measures could be workout during later stages while dealing with detailed design.

Environmental-friendly and smart-growth (EFSG) technique/framework

There are various environmental-friendly smart-growth (EFSG) tools/frameworks for assessing the sustainability of infrastructure projects. The most common EFSG frameworks, such as BREEAM, LEED and CASBEE are the main existing methods for assessing the building environment as well as sustainable infrastructure development. Inclusion of similar kind of EFSG framework along with EIA in feasibility study of PPP could become an effective tool to assess the impact of the project on the surrounding environment and society. One of the experts have suggested that the EFSG framework should be a part of the feasibility study in detail design or TEF (Techno-Economical feasibility Report), but inclusion of it should be through an evaluation body or advisory body. Implementation of EFSG based evaluation in the early phase of PPP project development will help to turn potential adversarial groups into advocates.

6.4.2 Stakeholders' and local public participation

PPP projects often encounter public opposition on social and environmental issues and in some extreme cases such challenges affect the financial viability of the projects. Similarly, all the respondents have strongly agreed that this is one of the challenges being faced by Indian PPP projects in the form of stakeholders and local public opposition during project development. Experts have expressed the need for introducing new innovative approach to improve stakeholder participation.

Special purpose company (SPC) - Jointly owned by government, users and developer

PPP projects are generally governed by SPV, which brings together various parties like lenders, public sector and export credit agencies, suppliers and off-takers. However, SPV lacks representation from users. In order to allow participation of all the stakeholders, alternative institutional mechanism in the form of a special purpose company, which is jointly owned by government, users and private developers, can be instituted for development of PPP projects. Process for inclusion of SPC mechanism in team formation should commence before the commencement of full feasibility study of PPP project.

Building information modeling (BIM)

BIM promotes an integrated project delivery approach that encourages collaboration amongst the various stakeholders to the project over its lifecycle. In PPP procurement process the maximum benefits from adoption of BIM could be derived by including it in need and option analysis of the feasibility study and utilizing it for independent monitoring during implementation and operation stages so that it can serve as an effective communication tool for stakeholder's participation in decision making.

Community involvement through partnering

PPP worldwide experiences indicate that PPP projects are often at risk from community and non-governmental organization (NGO) mobilization against the project. Community involvement can therefore contribute to PPP projects success by creating an enabling environment to resolve disputes relating to community over the project lifecycle. The community involvement could be established through creation of partnership between the public agency and local community-led NGO, who can play a key role in convincing the

community on the benefits of this project. However, the respondents have stated that the project sponsor should not enter into partnering with NGOs having a vested interest from either implementation or stoppage of the project. Furthermore, the focus of community participation should be to concentrate on convincing the communities about the project and not the PPP aspect of the project.

6.4.3 Value for money (VfM) analysis

Value for money is an optimum combination of whole life-cycle cost, risks, completion time and quality in order to meet public requirements. As per whole life cycle cost theory, higher capital expenditures are justified in order to gain more operating efficiencies. However, savings in operating costs would result from adopting sustainable design, which will increase capital costs and the associated risks. In practice, the private sector would try to reduce the capital expenditure and keep the associated risks level low. The respondents have criticized this misleading practice and have raised concern about not taking into consideration environmental and social externalities of the projects.

Environmental & social (E&S) costs and benefits in WLC estimation

VfM is the optimum combination of whole-of-life costs and quality of the good or service to meet the user's requirements. Inclusion of environmental and social costs and benefits in whole-of-life cost can streamline the PPP process to promote adoption of renewable energy sources and cost effective technologies as the current WLC estimation has not specifically given a due weightage to social and environmental dimension. Consideration of environmental and social costs, and benefits in WLC estimation for VfM analysis will also promote adoption of cost effective technologies and relied more on renewable energy sources. Furthermore, whole life-cycle costing should also attempt to include the cost of monitoring and testing environmental related issues at project site.

Climate change parameters and long term E&S impact in risk model

UNECE (2008) has indicated the need for dealing cautiously the risk and uncertainty through precautionary measures, when the environmental impacts of the activities are not known, until the likely impacts can be determined. The current risk model of VfM analysis should also include risks relating to climate change impact, and long term social and

environmental impact on project from natural calamities as the current model focuses on risks affecting the financial and economic viability of the project only.

Life cycle assessment approach using material calculator

LCA is a tool for the systematic evaluation of the environmental aspects of an infrastructure system through all stages of its life cycle. The adoption of LCA approach using a materials calculator would be useful to quantify and compare materials lifecycle impacts. One of the experts suggested that all the consumption based materials used for the project should be monitored for their impact on the environment through LCA. Using LCA approach will promote use of environmental label materials in the construction of PPPs and help to minimize environmental pollution and carbon emission impacts. In the similar lines, RAE (2005) mentioned that the life cycle assessment and scenario analysis are essential tools for comparison of energy technology options to select the most appropriate technologies to minimize pollution from the projects, thereby optimizing the project's VfM.

Independent assessor with knowledge of sustainability

Independent engineer conducts assessment of VfM on technical parameters like whole lifecycle costing; risk, and quality while the important parameters related to the cost of future social and environment risk are outside the purview of this study. If the above-mentioned strategies, like E&S cost and benefits of sustainable activities; and climate change parameters and long term E&S impact are included in WLC and risk model of VfM analysis, respectively, then an unbiased assessment of these strategies through the independent assessor would be required for this study. One of the experts has also suggested that government could include consultants who have practical knowledge of sustainability concept in the empaneled list of consultants.

6.4.4 Skill and knowledge of sustainability concepts

PPP projects require multidisciplinary and highly specialized expertise on account of complex nature of the business transaction. Public officials are not well trained in areas such as financial and legal matters and to fill this capacity gap, external experts such as financial experts, legal experts, and transaction advisors have been involved in PPP projects. Similarly, public officials also lack awareness about sustainability and green

concepts as applied to infrastructure development. The respondents have expressed the need to take substantial steps by central and state governments to enhance the capacity of existing manpower with respect to sustainability aspect.

Involvement of specialized sustainability strategic advisors

Sustainability strategic advisors are experienced consultants with sound knowledge of both engineering and sustainability principles who can provide tailored advisory services to infrastructure development organisations. They assist the organisations in developing strategies for attitude change and re-orient the decision making processes to give conscious attention to environmental and social objectives (UNECE 2008). The respondents have expressed the need for early involvement of specialized sustainability advisors to assist the contracting authorities in order to take into account sustainability considerations in PPPs. And, they have also indicated that these advisory firms can also partner with the organizations to enhance their long-term performance by making them understand the connection between sustainability and performance and show organizations how integrating sustainability into products, services and operations can lead to competitive advantage.

Training and awareness with respect to E&S goals

Capacity building programs have been undertaken by all the tiers of the Indian government to train the public procurement teams on bidding of infrastructure projects through PPP route. However, these programs need to be extended to build capacity to enable the procurement team to gain awareness and knowledge about including sustainability consideration in bidding documents preparation and tendering process. It has also been suggested by respondents on inclusion of such training modules will bring a change in attitude and help them in making procurement decisions that give conscious attention to environmental and social objectives of sustainability.

Inclusion of ‘on-the-job training’ modules in National PPP capacity building programs

Extending the current PPP capacity program of classroom-based seminars and workshops to practical ‘on-the-job’ training for the public entities has been cited as one of the strategies by respondents for enhancing the skills and knowledge of public officials for improving their institutional capacity and governance structure relating to sustainability

aspect. Conducting visit to PPP projects in India or abroad that have demonstrated successful implementation of the projects from sustainability perspective and inclusion of such pilot cases in training modules should be module for 'on-the-job' training. These training programs should become an integral part of current capacity building programs and attempts should also be made for international skill transfer while executing the projects.

6.4.5 Incentives for private sector to promote sustainability

Indian government has introduced several fiscal supports to make PPP attractive to private investors. Key initiatives include India Infrastructure Project Development Fund, Viability Gap Funding, tax breaks and access to infrastructure debt funds. The current schemes do not provide right incentives for private sector to invest, innovate and provide optimum solutions to adopt sustainable solutions and energy efficient systems.

Incentives to use renewable energy sources and biological materials

Through proper incentive schemes, private parties in PPP projects can be incentivized to provide innovative solutions. This opportunity can be used to promote private entities to consider design features and construction methods, and use building materials that generate optimum whole life costs. Similar kind of approach could also be used for capturing and leveraging the natural capital and promoting the usage of renewable energy resources and materials in a sustainable way.

Market mechanisms to develop their own solutions on E&S issues

The cases of PPP projects encountering time and cost overruns on account of various environmental and social resistances have been well documented worldwide. An alternative route for minimizing these issues could be attempted by inviting the private sector to include in the bid innovative strategies for resolving these environmental and social issues. It has also been suggested by some of the respondents that government should establish incentive structure that promote market mechanism which will make it feasible to maximize benefits or minimize costs to develop their own solutions and responses to the E&S problems.

Incentives for adaption and mitigation of climate change strategies

Implementations of adaptation and mitigation strategies are essential to reduce the impacts of climate change on PPP infrastructure. But at present, there are no incentives for private sector in implementing climate change adaptation and mitigation strategies for reducing the emission of greenhouse gasses (GHGs) through developing of PPPs. USDOT (2007) suggested for introduction of incentive scheme for adaption and mitigation of climate change strategies like reducing the emission of GHGs and minimizing energy use through efficient design and operation, fuel substitution or promote use of GHG offsets. One of the respondent mentioned that the ‘concessionaires could be rewarded through renegotiation/cash awards for adopting green technologies as climate change adaption and mitigation strategy’. The introduction of such kind of incentive mechanisms for promoting to implement various technologies for climate change mitigation and adoption strategies for PPP project development will help in fulfillment of the goal of sustainable development from the perspective of ‘efficient utilization of resources’ principle for sustainability.

Law regarding liability and compensation on environmental issues

Besides including provision to encourage private sector to adopt innovative solution to resolve environmental and social issues, provision should also be included to penalize for adversely affecting the environment. One of the respondents have stated that the public sector should think about including clauses in agreement to maintain the environmental benchmarks, beyond which penalty clauses will become imposed. The public sector also needs to establish law regarding liability and compensation to those persons who are adversely affected by pollution or who is creating the pollution. Moreover, the entire requirement related to liability and compensation on environmental issues should be well defined in request for proposal.

6.4.6 Bid preparation and evaluation

Bid proposals submitted by private sector in case of PPP projects are normally evaluated on basis of technical and financial aspects only. Furthermore, the criteria used for prequalification of bidders have also focused on technical, financial and legal aspects only. The majority of the transaction advisors, who play a key role in design of bidding process, have expressed that criteria used for bid evaluation of PPP projects are inadequate and evaluation should encompass social and environmental dimensions also. The evaluation

should be quality based selection, giving proportionate weightage on parameters like promoting green procurement, and experience in social and environmental mitigation.

Green procurement to invite innovative bid

Adoption of green procurement principles in bidding will give preference to bid that proposes to use innovative technologies to reduce pollution, climate change mitigation and recycling of waste. Efficiency, expertise, and innovation from the private sector could be utilized to contribute to a better infrastructure and greater cost and time savings across the construction and operation phase of the project, thereby increasing the VfM equation of the project. However, government must fix clear objectives and specifications in contracts and identify the key performance indicators, as well as environmental risks and the party that should manage them.

Environmental and social criteria in bid evaluation

The current procurement process is designed to select concessionaire predominantly on the basis of financial criteria. Inclusion of practices to give more preference to private entities which actively adopt environmental and social protection policies such as 'Equator Principles' will promote private sector to give more weightage to avoid serious damage to environment and society. Finally, besides giving weightage to it during bid evaluation stage, this parameter should be included as one of the performance parameters subject to monitoring during project implementation stage.

Additional bidding criteria for sustainable construction practices

Sustainable construction practices such as lean construction principles are the set of tools that assist in maximizing client's delivered value while eliminating waste. Elimination of waste will lead to improvement of quality and reduction of production time and cost, thereby resulting in better VfM for PPP projects. Large infrastructure projects especially procured through PPPs are characterized with the excessive use of natural resources and consumption of energy, which have a crucial impact on the environment. In view of this, additional conditions can be introduced in the PPP procurement process to promote utilization of efficient construction and management techniques to minimize construction, and operation and maintenance related wastes.

6.4.7 User charges for infrastructure services

Majority of the experts representing government and transaction advisors have indicated that user charges for infrastructure services are high and this will make the service unaffordable and deny access to poorer section of the society. There is a need for formulating innovative pricing mechanism to ensure that the interests of users are protected taking into consideration affordability of users and certainty of pricing and revenue stream for private investors.

Comprehensive communication program through value analysis

Creating awareness among the consumers to pay for the infrastructure services in exchange for uninterrupted availability is a key determinant for successful delivery of PPP projects, particularly in social sectors projects. It is recommended that local governments should conduct comprehensive communication program to educate public users about the necessity of improved services, as the new service saves their time and cost. Awareness about the value created in the form of saving of time and operational cost due PPP services should be communicated with the affected people. Inclusions of such program in need and option analysis, which is carried out during feasibility study, will educate public about the necessity of user charges and improve stakeholders' participation in PPP process.

Modified viability gap funding (VGF) mechanism

Viability gap funding has been adopted as the financial support to develop financially unattractive projects on PPP mode in India. As per this scheme, government provide grant up to 40% of total project cost to make the projects attractive to private investors. However, this VGF funding is not sufficient for projects undertaken in regions with lower economic activity and for projects in social sectors where local public are opposed to pay higher tariff charges for infrastructure services. The extent of financial support should be determined on a project to project basis instead of fixing the funding limit at 40% of project cost.

Institute differentiated rates mechanism as per time, location and usage

PPP projects are normally criticized for the high user charges levied for the infrastructure service provided, leading to resistance from the community. In order to avoid these

adverse social consequences, alternative tariff structure where user charges are differentiated by time, location and usage intensity will help to maximize revenues and ensure efficient capacity usage. Such a mechanism will enable users to avail the infrastructure services during period of low tariff and this will help in countering the complaints from users on high user charges for infrastructure services. Inclusion of such mechanism of institute differentiated rates would help in minimizing conflicts related to user charges and help in satisfying intra-generational and intergeneration equity goals of sustainability.

6.4.8 Risk allocation and mitigation in model concession agreement

Concession agreement defines the roles and responsibilities of both the public agency and private investors and the risks allocated to both the parties. Typically, the risks that normally considered in the risk allocation framework are the ones that adversely affect the financial viability and bankability of the projects. Majority of the public and private sector experts have expressed reservation about the current risk allocation framework as it has not considered the risks of future unforeseen impacts on the projects.

Clauses to share cost for future climate change impact on project

The model concession agreement used for PPP projects in India recommends mitigation of force majeure risk through insurance. The adverse impacts on the project due to effects of climate change thereby affecting the contractual responsibilities and requiring additional investment to adapt to these changes have not been accounted in the current risk allocation mechanism. The respondents have expressed that the current model concession agreement should have flexibility to address future unforeseen or unpredictable issues related to climate change, and related risks. They were also of the opinion that additional clause or in the form of sub-clause of force majeure clause should be included in model concession agreement with the provision for sharing the costs of future unexpected risks due to climate change impact on project, through proper monitoring by independent assessor.

Renegotiation mechanism to address socio-political or economic changes

The tenure of infrastructure projects spans several decades wherein the socio-political and economic environment could change resulting in a situation wherein contractual

responsibilities need to be changed to adapt to the new environment. To counter such situation, the current model concession agreement, which is a rigid contract, needs to bring in flexibility in concession agreement design. One of the ways to bring in flexibility is to move away from traditional simple contract model to hierarchical contract model. In case of hierarchical contract model, in place of indicating specific clauses to be renegotiated, when the set of ‘trigger’ conditions get activated, the concerned set of clauses are re-examined by a panel of participants. Such mechanism could be built into the contract as a renegotiation mechanism. Such mechanism will enhance the risk allocation mechanism, improve the relationship between public and private sector, and minimize goal conflicts between them. The public and private sector will be willing to engage in a meaningful dialogue with an understanding that the contracts could be re-examined in the event of extenuating circumstances and that neither party would unnecessarily have to solely bear the consequences of unforeseen events.

Provision for additional finance for robust financing structure

PPP projects are normally characterized with long-term concession contract between public and private sector. In some of the cases, the concession period lasts for 20 to 30 years. The projects may face unexpected and unforeseen risks which have a rise on account of their long concession period. DOIT (2010) suggested that the projects that are based on long term plans should have robust business cases and developed and tested over a number of years in order to ensure that the final project design and specification meet the needs of users and the wider community. The government, in order to take care of this aspect, should consider for provision of additional financial mechanism to test the PPPs for the unexpected and unforeseen risks that may arise on account of its long-term concession period. Besides additional financial mechanism, complex PPP projects with high risk profile must be staffed with experienced professionals to ensure that the project has a sound business case along with a robust cost-benefit analysis, sound risk assessments, and full socio-environmental impact analysis (DOIT 2010).

6.4.9 Bidding and transaction cost

Lengthy and complicated bidding process increases the bidding and transaction cost of PPP project procurement. High transaction costs limit the competition to financially sound

large private entities. The experts, particularly representing the private sector, have suggested the need for altering the bidding process to reduce transaction cost.

Promote integration of relational contracting principles

Relational contracting (RC) helps to bind the members of the group towards common goals and help in building trust amongst them. This help to streamline the dispute resolution process and promote equitable risk sharing. Integrating relational contracting principles in PPP will help to optimize the long term contractual arrangements of PPPs, help to balance risk allocation between public and private sector, and minimize transaction cost. One of the respondents have stated that benefits of integrating relational contracting principles in PPP project will be maximized when it is integrated during the pre-bid stage through public appraisal.

Probity arrangements to ensure integrity through probity advisor

Independent assessment of the transaction and bidding procedure for PPP projects through a probity advisor may help to reduce the bidding and transaction cost. The probity adviser will help in assessment of procurement process, ensure that prescribed obligations are adhered, provide advice on probity issues which may arise before and during the procurement process, and ensure that the process is equitable and conducted with integrity. Comprehensive assessment and monitoring of PPP procurement with the help of probity advisor will help to develop trust between the parties and maintain the reputation which are core ingredients for sustainability of PPP project.

Flexibility to private sector for preparation of entire master plan

Providing enough flexibility to private sector during PPP development and procurement stage will facilitate them to submit innovative and competitive bids. In addition to this, flexibility in PPP procurement process will also equip the organization to respond to potential internal or external changes during procurement stage and promote effective participation of bidders. In line with this, one of the respondents have stated that flexibility has to be given to private partner for preparation of master plan during the designing of the PPP project and the master plan must be vetted by a competent authority. Finally, the existing laws which empower local/state governments to prepare/approve master plan

should also be modified to give enough flexibility to respond to changes in the procurement process.

6.4.10 Transparency and accountability during bidding

The governments have established procedure to maintain transparency, equity and fairness in bidding of infrastructure projects. However, the experts who participated in the study have raised concerns about lack of transparency and accountability in the Indian PPP bidding process.

Strategic communication plan (SCP) as part of procurement policy

The private sector has often complained about unavailability of information pertaining to the project in spite of the appointment of a procurement and evaluation team for communication with the bidder. Furthermore, publicity about projects taken up on PPP mode often focuses on criticisms about the project from PPP critics and from media houses. However, a proactive stance should be adopted to shift the focus to topics like economic benefits from the project, greater service access provided to those in needs, especially socially and economically disadvantaged groups. This could be achieved by including strategic communication plan as part of the procurement policy thereby providing a platform for close debate between the critics and proponents during the bidding and execution stage.

Appoint fairness and process auditors as a third party independent expert

Audit mechanism is normally used by governments to maintain transparency, equity and fairness in development and implementation of public sector projects including PPP project. However, the role of auditors comes only after the completion of bidding stage. A regular monitoring mechanism by a 'fairness and process' auditors (FPAs) will provide a sense of assurance to government sponsors, bidders and the public that the procurement process will fair, equitable, and appropriate (UNECE 2008). Similar mechanism has also been suggested by the respondents and has recommended that the FPAs must have no ties with the public and private entities and they should get involved in early stage of procurement process so that they can develop a scrupulous understanding of the project in order to maintain a complete and unbiased audit of the bidding stage. Inclusion of FPAs services in PPP

procurement process will, therefore, help to enhance transparency in procurement process and accomplish the strong governance aspect of sustainability.

Institutional bodies that can independently scrutinize projects

An independent and technical review of PPP projects by a separate institutional body which can scrutinize the projects can help in ensuring transparency and accountability of PPP projects (UNECE 2008). Similarly, the respondents were also of the viewpoint that an institutional independent body should be formed consisting of members who have excelled in the fields of environment, finance, media and engineering. This group can keep a close look on the sustainability matter and make the public and private party aware of any issue of concern. The role of this body will be different from the functions carried out the PPP units which have been developed to streamline the PPP process and build capacity at organization level.

6.4.11 Relationship between public and private sector

Private sector main motive for participation in PPP projects is driven by business interest in the project while public sector is concerned about fulfilling the socio-economic interests of the society. The difference in the motives of both the parties lead to goal conflict. The goals of the private sector fundamentally oppose those of the public sector. The experts from government and private sector have also indicated the prevalence of goal conflicts between the public and private partner.

Early participation of private sector through articulation of a legal policy

Participation of private sector in the early stage of project procurement could help in improving the relationship between public and private sector. Mahalingam (2010) suggested that the government should introduce legal act/policy that allows private sector to identify infrastructure sector for development through PPP route. This will enhance private sector confidence in PPP projects. In the similar lines, the state of Gujarat had enacted such an act and this could be attributed for the large amount of infrastructure development through PPPs (Mahalingam 2010).

Establish the public-private interaction forums to understand each other

Mahalingam (2010) suggested introduction of interaction forums to improve the relationships amongst the public and private sector. Interaction forums will help them to understand each other better, own their shortcomings, hold open discussions, and work through issues that come up during the course of the project. Mahalingam (2010), further, mentioned that such events will bring the project stakeholders together and can play an important role in avoiding misconceptions relating to the private sector's honesty or the public sector's productivity. Experts have also suggested that monthly interactive meeting could be an innovative option for resolving issues amicably between the two parties to the contract.

6.5 Summary

The preliminary framework on how to enhance the sustainability of PPP procurement process had been investigated in this stage of the study. The preliminary framework, which has been developed from literature review, has been examined through focused interviews with the various stakeholders involved in development of PPP projects in India. The 18 experts representing the stakeholders such as financial institution, private sector, transaction advisors, and government are the unit of analysis for the study.

The interview data were analyzed using constant comparison analysis, classical content analysis, componential analysis, and taxonomic analysis techniques in NVivo10. It has been confirmed through classic content analysis technique that the maximum number of respondents have been coded for all the three parameters, i.e. guiding principles, strategies, and shortfalls. It has also been confirmed through componential analysis using matrix query and bar charts that all the four groups of respondents have coded for the feasibility of guiding principles, strategies, and shortfalls. Finally, interrelationship among the strategies, shortfalls, and deliverables of PPP procurement process have also been established using taxonomic analysis through model development in NVivo10.

Furthermore, a micro-interlocutor analysis techniques was conducted to analyze the interview data to confirm the findings. Micro-interlocutor analysis through matrix method has established agreement amongst the respondents on principles, strategies, and shortfalls in PPP procurement process.

The final framework, which had been developed from the study, defines the need for enhancing the PPP procurement with respect to the eleven categories of conceptual areas. These categories of conceptual areas representing the deliverables of PPP process are: EIA, VfM analysis, stakeholders' participation, skill and knowledge of sustainability concepts, incentives to private sector, bid preparation and evaluation, user charges for infrastructure services, risk allocation & mitigation in MCA, bidding and transaction cost, transparency and accountability during bidding, and relationship of public and private sector. Finally, the final framework also includes the strategies to improve the procurement process with respect to the eleven categories of conceptual areas.





CHAPTER 7

ASSESSMENT OF CAUSAL BEHAVIOR OF FRAMEWORK

7.1 Introduction

This chapter presents the fourth research stage of the study where in the causal behavior of the various variables involved in the final framework has been assessed through the system dynamics research approach. The qualitative system dynamics modeling using causal loop diagrams (CLDs) has been selected as the research approach to define the causal relationships amongst the key deliverables, shortfalls/conceptual areas and strategies in PPP procurement process. The qualitative research inquiry gathered data from secondary and primary sources through literature review and focused interview, respectively. Based on these results, the qualitative system dynamics model using CLDs had been developed through three chronological stages, i.e. conceptual, preliminary and modified system dynamics model development.

This chapter presents this model development process in five sections. The second section of the chapter briefly explains the qualitative system dynamics using CLDs that had been used as the research method in this stage. The third section explains the development of conceptual system dynamics model relating to the key deliverables in current Indian PPP procurement process. The development of preliminary system dynamics model to identify the various sustainability issues under the respective deliverables of the PPP process is discussed in the fourth section. The modified system dynamics model developed from the preliminary model through inclusion of strategies into the various deliverable in PPP procurement process for enhancement of the sustainability is the focus of the last section.

7.2 Qualitative System Dynamics using CLDs

The current stage has an attempt to gain insights on the inter-relationships between the deliverables of PPP procurement process and the concept of sustainable development. The main aim of this stage is to assess the causal behavior between the various variables of the final framework using system dynamics modeling. The variables include key deliverables, shortfalls/conceptual areas and new strategies of PPP procurement process for the analysis. In order to achieve the aim of this stage, the study has adopted qualitative system dynamics

modeling using CLDs as a research approach. The qualitative system dynamics modeling has been conducted by using the educational free software Vensim PLE (Personal Learning Edition). The main reason for adopting of system dynamics approach is that its capacity for providing analytic solutions for both complex and nonlinear system (Sterman 2000). Further, Coyle (2000) stated that the qualitative data could be better managed and analyzed through CLDs, which emphasis on identifying feedback paths that produce either balancing or reinforcing feedback which can be used in a learning process. Also, Park et al. (2009) mentioned that system dynamics is also useful for providing systematical explanations and policy alternatives that are often counterintuitive and discerning, and for elucidating problems and identifying feedback processes with CLDs. CLDs are the causal diagram that aids in visualizing how different variables in a system are interrelated. The diagram consists of a set of nodes and edges. Nodes represent the variables and edges are the links that represent a connection or a relation between the two variables (Sterman 2000). These variables of CLDs are connected with the arrows denoting the causal influences between variables. In developing the CLDs, each causal link is assigned a polarity, either positive (+) or negative (-), to indicate how the dependent variable is impacted when the independent variable changes. These polarities are generally shown at the head of the arrow. The positive symbol originating in the middle of a closed feedback loop denotes the loop acting to reinforce variable changes in the same direction as the change. This loop is called positive feedback loop (reinforcing feedback loop, R). On the other hand, the negative symbol originating in the middle of a closed feedback loop denotes the loop to acts opposite to a change. And, this loop is called negative feedback loop (Balancing feedback loop, B). The reinforcing feedback loops emphasize the impact of a study variable while balancing feedback loops reduce the impact of the study variable (Sterman 2000). In this study, system dynamics model using CLDs have been constructed using three steps introduced by Vennix (1996): (i) defining the various variables (key deliverables, shortfalls, and strategies), (ii) defining the causal relationships between variables with causal links (+ or -), and (iii) defining the system behavior of various variables for a single problem/shortfall or its solution through development of feedback loops (balancing or reinforcing). In the view of the collection of qualitative data, Sterman (2000) mentioned that the qualitative inquiry could be better accomplished by using as many sources of data as possible to gain insight into the structure of the problem situation and the decision processes of the actors in it. Based on the findings from previous research stages (literature review findings from stage 1 and 2 and interview findings from stage 3),

a qualitative system dynamics model using CLDs has been developed to achieve the research aim through the three chronological sub-stages of system dynamics modeling. The sub-stages include conceptual model, preliminary model, and modified model development.

- Conceptual model – Initially, a conceptual system dynamics model has been developed to recognize the key/important deliverables in current Indian PPP procurement process through the literature review of government documents, reports, and online database.
- Preliminary model – Secondly, a preliminary system dynamics model has been developed to identify the various sustainability issues under respective deliverables of the PPP process using literature review findings.
- Modified model – Lastly, a modified system dynamics model has been developed through inclusion of strategies to enhance the sustainability of various deliverable in PPP procurement process in the preliminary system dynamics model. The findings from literature review (stage 1 and 2) and focused interviews (stage 3) have been used for development of the modified system dynamics model.

7.3 Conceptual Model of PPP Development

The review of the documents of PPP procurement process streamlined by the DEA (2011) at the Federal level and online data-base available at PPP Cell (2011) on detail activities and deliverables of PPP procurement process have indicated that the four key deliverables include the feasibility study, procurement preparation, bidding process, and contract finalization. It has been observed from the focused interviews that the four key deliverables play a major role in execution of PPP procurement process in India. The relationships between the deliverables have been modelled using system dynamics. Figure 7.1 shows the interrelationship between the four key deliverables/main variables. The four key deliverables are chronologically related and each key deliverable is associated with sub-deliverables. The relationships between these four variables/key-deliverables are related with reinforcing feedback loops. At the beginning, the feasibility study has been conducted to investigate whether the project is desirable, viable, and achievable investment through assessment of projects cost, benefits and risks. Feasibility study of the project is carried out along with the environmental impact assessment (EIA) and social impact assessment (SIA), and further, the projects are assessed for suitability of developing as PPP model

using value for money (VfM) analysis. Once it has been proved that it is feasible to develop it on PPP basis, then steps are taken to initiate procurement of the project through PPP route. The first step in this direction of procurement preparation is formation of procurement and evaluation team for reviewing project information and preparing the procurement documents such as request for proposal (RFP) and concession agreement (CA). After the procurement documents preparation, the bidding proceeding is executed by inviting bids from pre-qualified bidders. The procurement and evaluation team, then, evaluates the bids and selects the preferred private sector for the execution of the PPP project. Finally, the procurement process concludes with contract finalization wherein the contract is awarded to the selected private sector.

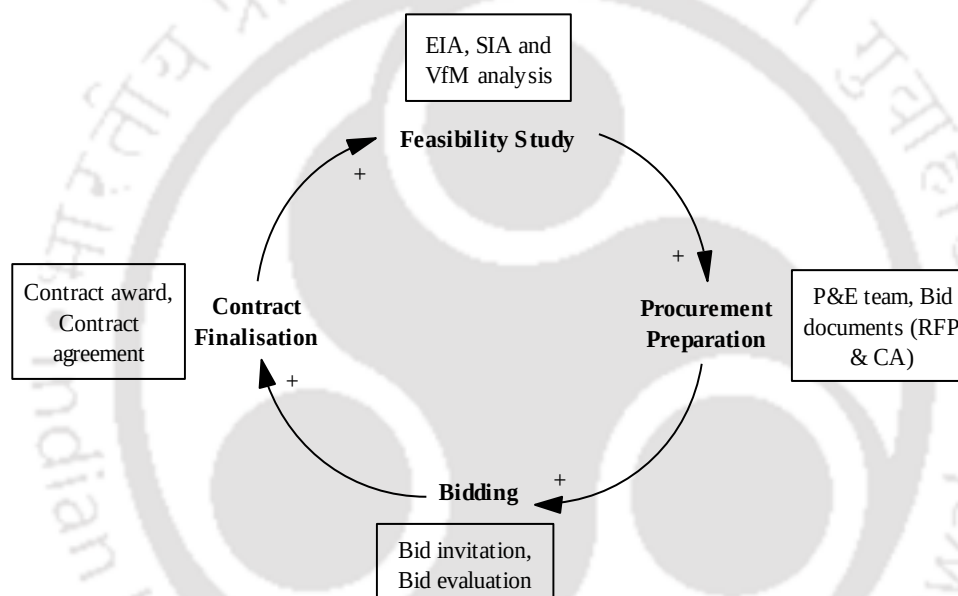


Figure 7.1: Conceptual system dynamics model for PPP development

7.4 Preliminary Model: Sustainability Issues in PPP Process

The main aim of the preliminary system dynamics model is to identify the various sustainability issues under the respective deliverables of the PPP process. Furthermore, the relationships between the shortfalls and the sustainability principles along with the various causes and consequence have been defined through construction of feedback loops. Figure 7.2 shows the balancing feedback loops (B1 to B11) integrated in the conceptual model of PPP procurement process. It could be observed from the preliminary system dynamics model that the identified shortfalls are relating to the four key deliverables of PPP process. These deliverables are further divided into sub-deliverables which are treated as variables

to model them as loops (B1 to B11) expressing how these adversely affect the sustainability principles. The sustainability principles adversely affected by the shortfalls have been represented in the preliminary system dynamics models with a 'Rectangular Box' in Figure 7.2. Brief discussion about how the sustainability principles that have been adversely affected by the shortfalls have been modelled using system dynamics model through CLDs is given in the following sub-sections.

Failure of socio-ecological system integrity in EIA and bid evaluation:

EIA in PPP procurement process is a part of the feasibility study to assess the impact of the project on the surrounding and community. But, the current EIA carried out during the feasibility study assesses only the acceptable impacts on the project while avoiding consideration of the social and environmental benefits to the community and surrounding, respectively. Limitations in the EIA assessment adversely affect accomplishment of sustainability principle 'socio-ecological system integrity'. The negative impact of the EIA has therefore been represented as a negative or balancing feedback loop (B1) in the preliminary model. Similarly, the bids submitted by private entities in response to the call for request for proposal (RFP) have been evaluated with respect to technical and financial aspects only. This evaluation fails to take into consideration environment and social (E&S) aspects and this adversely prevents fulfillment of the prerequisites of 'socio-ecological system integrity' principle of sustainability. This effect has been modelled in the preliminary model as a balancing feedback loop (B6) showing the negative dynamics behavior on procurement preparation.

Inefficient resource utilization in VfM analysis:

PPP due diligence activity is a part of the feasibility study to evaluate the project with respect to risk allocation, financial viability and value for money (VfM). The current risk evaluation model in VfM analysis fails to take into account future unforeseen risks of the project. Furthermore, E&S externalities and costs have not been given due weightage in the whole life-cycle costs (WLC) evaluation for VfM analysis. These adversely affect 'efficient resource utilization' principle of sustainability. These effects have been shown as two balancing feedback loops (B3 and B3') in the preliminary system dynamics model. Another complaint from the private sector has been regarding less incentives to private sector for adopting energy efficient system. This lack of incentives affect the efforts to

optimize the project performance to achieve sustainability goals. This effect has been shown in the preliminary model using a balancing feedback loop (B5).

Failure of socio-ecological civility and governance in stakeholder management:

In PPP procurement process, various stakeholders are involved for effective completion of all the four deliverables. For instance, stakeholders like local people and NGOs can play an important role in social impact assessment (SIA) conducted as part of the feasibility study to highlight the key challenges expected to be faced by them. However, their viewpoints have been not sincerely taken into consideration during SIA study and this affects ‘socio-ecological civility and governance’ principle of sustainability. This negative system behavior on the feasibility study has been modeled as a balancing feedback loop (B2) in the preliminary model. The procurement team (P&E team) is another stakeholder who plays a key role in procurement preparation. This team, however, lacks knowledge about sustainability and do not give much importance on promotion of innovation in procurement process. This seriously affects ‘socio-ecological civility and governance’ principle of sustainability and negatively on system behaviors of procurement preparation (shown as balancing feedback loop, B4). Finally, the lack of transparency during bidding and goal conflicts during contract finalization also negatively affect the system with respect to ‘socio-ecological civility and governance’ principle of sustainability (shown as balancing feedback loop, B10 and B11).

Inadequate precautionary and adoption measures in MCA:

The public sector, though, has managed and allocated various risks amongst the public and private sector through the model concession agreement (MCA) but the risk allocation norm regarding future unforeseen risks relating to climate change impact on the project is outdated. Also, there are various complaints from private sector that the current MCA is a very rigid contract in terms of lack of flexibility to mitigate the future unexpected risks of the project. These issues fail to promote ‘precautionary and adoption’ principle of sustainable development and lead to negative system dynamics behavior thereby represented in the preliminary model using a balancing feedback loop (B8).

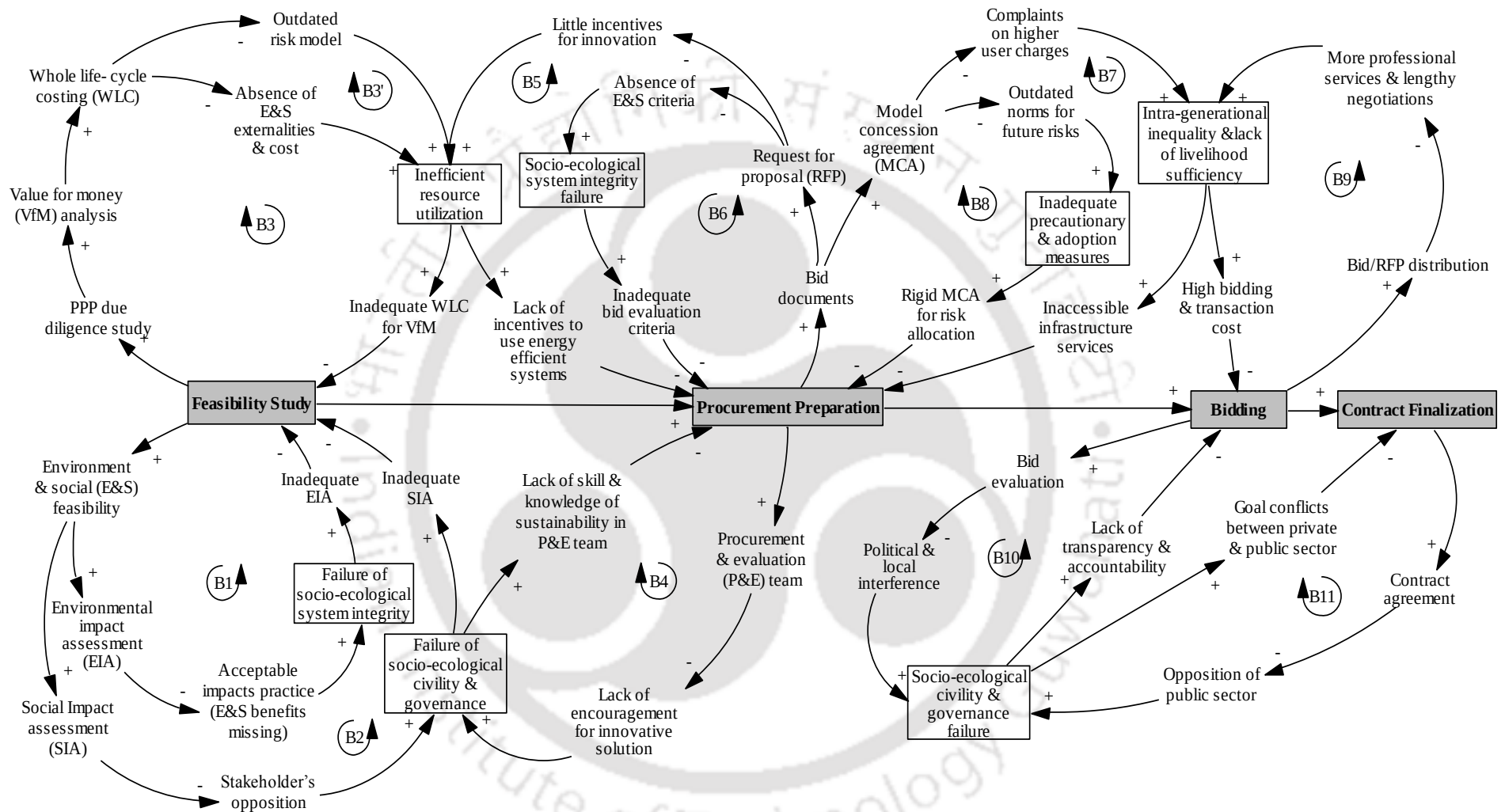


Figure 7.2: Preliminary system dynamics model for sustainability issues in PPP process

Intra-generational inequity and lack of livelihood sufficiency in user charges, and bidding and transaction cost:

Public sector has established a regulatory mechanism to implement effective user's charges for infrastructure services but the users have complained against PPP projects on account of its higher tariff charges. This prevents accomplishment of 'intra-generational equality' and 'livelihood sufficiency' principles of sustainability. The higher user charges will make the service unaffordable and prevent access to infrastructure services to the poorer section of the society. The inaccessibility of infrastructure due to high user charges negatively affects the system dynamics behavior on procurement preparation (shown as balancing feedback loop B7).

The PPP procurement process has well-established bidding process but the bidding process suffers from high transaction and tendering costs due to lengthy negotiation and need for extensive professional services. This adversely affects the requirement of the principles of 'intra-generational equality' and 'livelihood sufficiency' of sustainability. The negative system dynamics behavior on bidding process has been represented in the preliminary model using the balancing feedback loop (B9).

7.5 Modified Model: Inclusion of Strategies for Enhancement

The preliminary model showing the adverse effects of the shortfalls on the sustainability of PPP procurement process has been modified with inclusion of strategies identified from focused interviews. The strategies have been integrated in order to overcome the adverse impacts of the shortfalls on the respective deliverables. The modified system dynamics models have been developed for improving the procurement process with respect to the four key deliverables such feasibility study, procurement preparation, bidding process, and contract finalization. The models for respective deliverables are discussed in the following sub-sections.

7.5.1 Feasibility study

With respect to feasibility study, the negative impacts of the three sub-deliverables such as EIA, SIA, and VfM analysis have been modelled as balancing feedback loops (B1, B2, B3, and B3') in Figure 7.2. In order to overcome the adverse impacts of these sub-deliverables, the respondents have suggested various strategies to enhance these three sub-

deliverables to achieve the sustainability goal and further improve the system dynamics behavior relating to feasibility study. Figure 7.3 shows the modified model after integration of the suggested strategies in these three sub-deliverables. For improvement of EIA, respondents have suggested implementation of pre-assessment policy and advocated use of advanced tools to optimize the E&S benefits. One of the pre-assessment policies suggested was to incorporate E&S consideration in policy, plan and program during the identification phase of PPP process through strategic environmental assessment (SEA). Another pre-assessment policy has been to include assessment of climate change considerations (CCCs) along with EIA in the development phase of PPP process. The positive impact on inclusion of these two strategies in the system dynamics model has been shown as reinforced feedback loops R1b and R1c in Figure 7.3. Inclusion of strategy to utilize advanced rating tools like LEED, CEEQUAL, and BREEAM along with the EIA to improve the system dynamics behavior of the feasibility study has also been shown as reinforced loop R1a in Figure 7.3.

With respect to the other sub-deliverable on stakeholder participation, the respondents have suggested that the stakeholders' opposition could be minimized through better communication and partnering with stakeholders. Better partnering should be implemented by encouraging community involvement with the ULBs. Establishment of special purpose company (SPC), jointly owned by users, public and private sector would also help in improving the partnerships amongst the stakeholders. The positive impact of the inclusion of these two strategies has been shown in the modified model using the positive/reinforced feedback loops R2b and R2c, respectively. Furthermore, another strategy to improve stakeholders' participation is relating to adoption of building information modeling (BIM) for better communication and enhancing the stakeholder's participation in decision making. The inclusion of BIM in feasibility study would be enhancing the sustainability of SIA process and further improves the system dynamics behavior (highlighted using the reinforced feedback loop R2a).

The respondents suggested that the adverse impacts of outdated risk model and failure to account for E&S externalities and cost in WLC evaluation of VfM analysis could be improved through inclusion of the following three strategies. Inclusion of green accounting concept will help to take account for E&S cost and benefits in WLC. And, positive impact of this on dynamic behavior of VfM has been shown by reinforced feedback loop R3b. Similarly, inclusion of climate change parameters in risk evaluation model for WLC has

been represented by reinforced feedback loop R3c. Finally, the adoption of life cycle assessment (LCA) approach in evaluating VfM will help in promoting use of environmental label material and this has been represented by the reinforced feedback loop R3a. The respondents have also suggested that the VfM analysis could be further improved if independent auditors are used in the evaluation exercise. The dynamic behavior of inclusion of auditory service to audit the VfM analysis on the feasibility study has been represented using the reinforced feedback loop R3d.

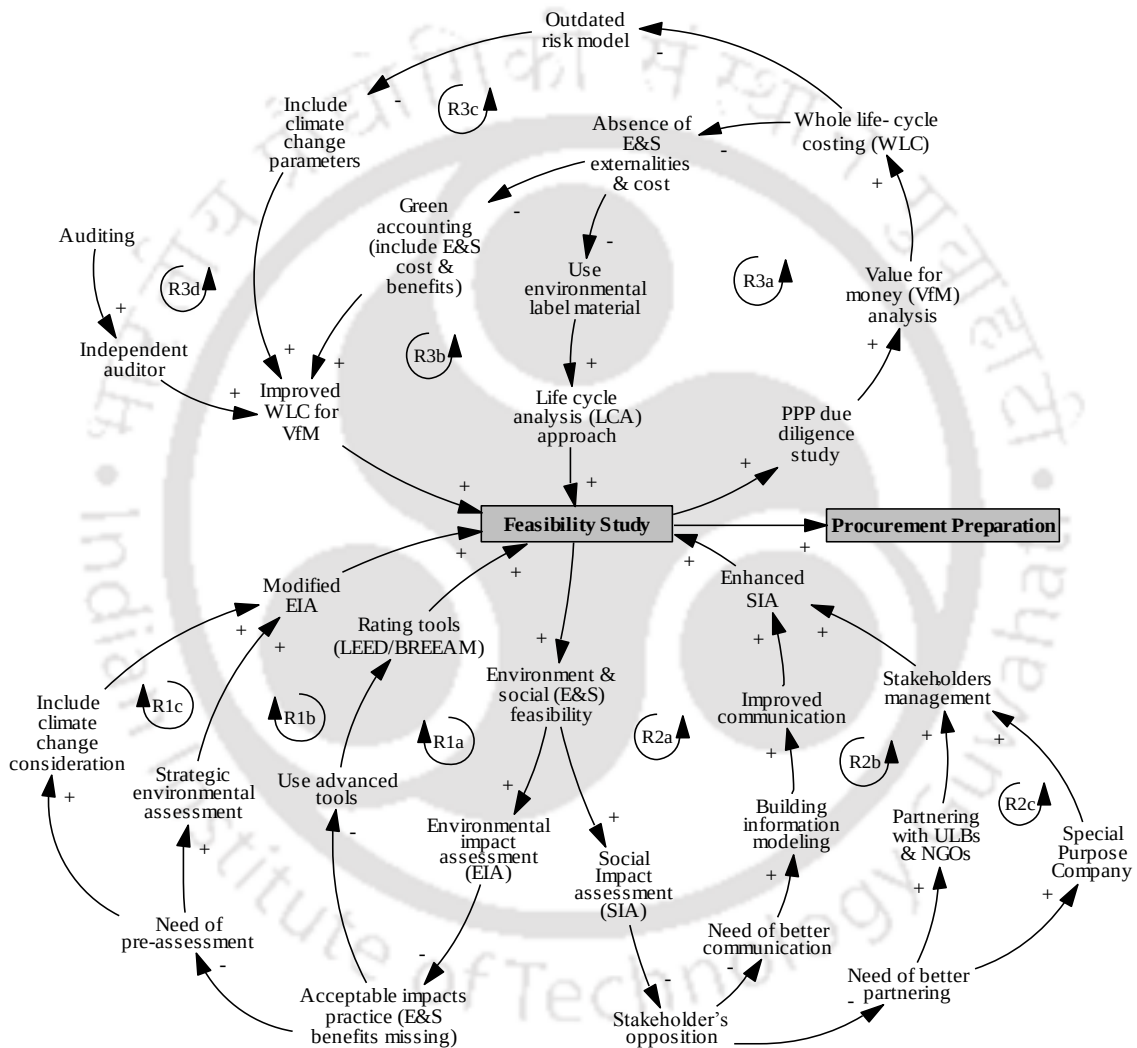


Figure 7.3: Modified system dynamics model to enhance the feasibility study

7.5.2 Procurement preparation

The adverse impacts of sub-deliverables as RFP, MCA, and P&E team on system dynamics behavior relating to procurement preparation have been highlighted using the balancing feedback loops B4, B5, B6, B7, and B8 in preliminary model. Besides

confirming the occurrence of these sustainability issues, the respondents have suggested various strategies for enhancing these sub-deliverables in order to promote sustainability.

The lack of skill and knowledge about sustainability by the procurement and evaluation (P&E) team could be improved by organizing various sustainability awareness programs for the P&E team. One of the programs will be to include sustainability educational program as part of the training for P&E team members before the procurement preparation. Another program would be establishment of 'National PPP training program' through 'on the job training' to teach the practical knowledge of sustainability to P&E team by the PPP unit. The addition of these two programs have been highlighted by the positive/reinforce feedback loops R4a and R4b in Figure 7.4. Furthermore, the experts have suggested appointment of external advisor with knowledge and experience of sustainability for monitoring the performance of 'National PPP training program'. The assistance of external advisor for optimizing the performance of training program would help in improving the system dynamics behavior of procurement preparation and this has been highlighted using the positive/reinforced feedback loop R4c in Figure 7.4.

The other sub-deliverable relating to procurement preparation on RFP document has been criticized for lack of incentives and inadequate bidding criteria. Respondents have suggested various strategies to overcome these sustainability issues. One of the strategies has been to establish an incentive structure through a market mechanism that would help in promoting private sector to discover solution for E&S issues. Another strategy has been to provide incentives or subsidies to the private sector for optimizing WLC of project through promotion of usage of renewable energy sources and biological materials. Third strategy has been to introduce incentives for adaption and mitigation of climate change impact on the project. The final strategy has been related with establishment of law regarding compensation and liability for those persons who have been adversely affected by pollution and who are creating pollution, respectively. Inclusion of these four strategies would give private sector additional incentives for innovative solutions and the impact of these has been represented by the positive/reinforced feedback loops R5a, R5b, R5c, and R5d.

Inadequate bid evaluation criterion is another sustainability issue that needs to be improved through inclusion of three strategies by introducing new procurement policies. The first strategy suggested by respondents has been to adopt green procurement policy to invite those bids which use innovative technologies to reduce pollution and climate change

mitigation. Another strategy has been to include E&S criteria besides technical and financial criteria in bid evaluation. This strategy will help to comply with the requirement of 'Equator Principles' and help in assessment of E&S impact on the project. The third strategy suggested by respondents has been to include bidding criterion that assess promotion of lean construction approach for minimizing construction waste. The impact of these strategies on the system dynamics behavior has been highlighted using positive reinforced feedback loops R6a, R6b, and R6c.

The MCA, another sub-deliverable of procurement preparation, has been criticized for not being flexible to account for unforeseen risks and setting high user charges for infrastructure services. Respondents have suggested three strategies for the issue relating to high user charges. The first strategy has been to include a comprehensive communication program to educate the public users about the necessity of improved infrastructure service resulting in time and cost savings. The second strategy has been to enhance current viability gap funding (VGF) up to 60% (which is currently 40%) of total project cost so that the user's charges could be minimized. The third strategy has been to implement an institutional differentiate mechanism that could enable adjustment of user charges according to time, location and uses. The effects of these strategies on system dynamics model has been shown using the positive reinforced feedback loops R7a, R7b, and R7c. With respect to the issue of inflexible contractual provision of MCA for future unforeseen risks mitigation, three strategies have been suggested by the respondents. The first strategy has been to adopt a flexible support mechanism to devise mitigation measures for future unexpected climate change risks and unexpected site risks due to hazardous materials discovered during project execution. The support mechanism could be in the form of insurance program. The second strategy suggested by the respondents relates to inclusion of a renegotiation mechanism in MCA to address various socio-political or economical changes that could not be handled through the current MCA. Lastly, creation of a robust financing mechanism with more government support has been the third strategy suggested by them. The inclusion of these three strategies has been shown using the positive reinforced feedback loops R8a, R8b, and R8c in Figure 7.4.

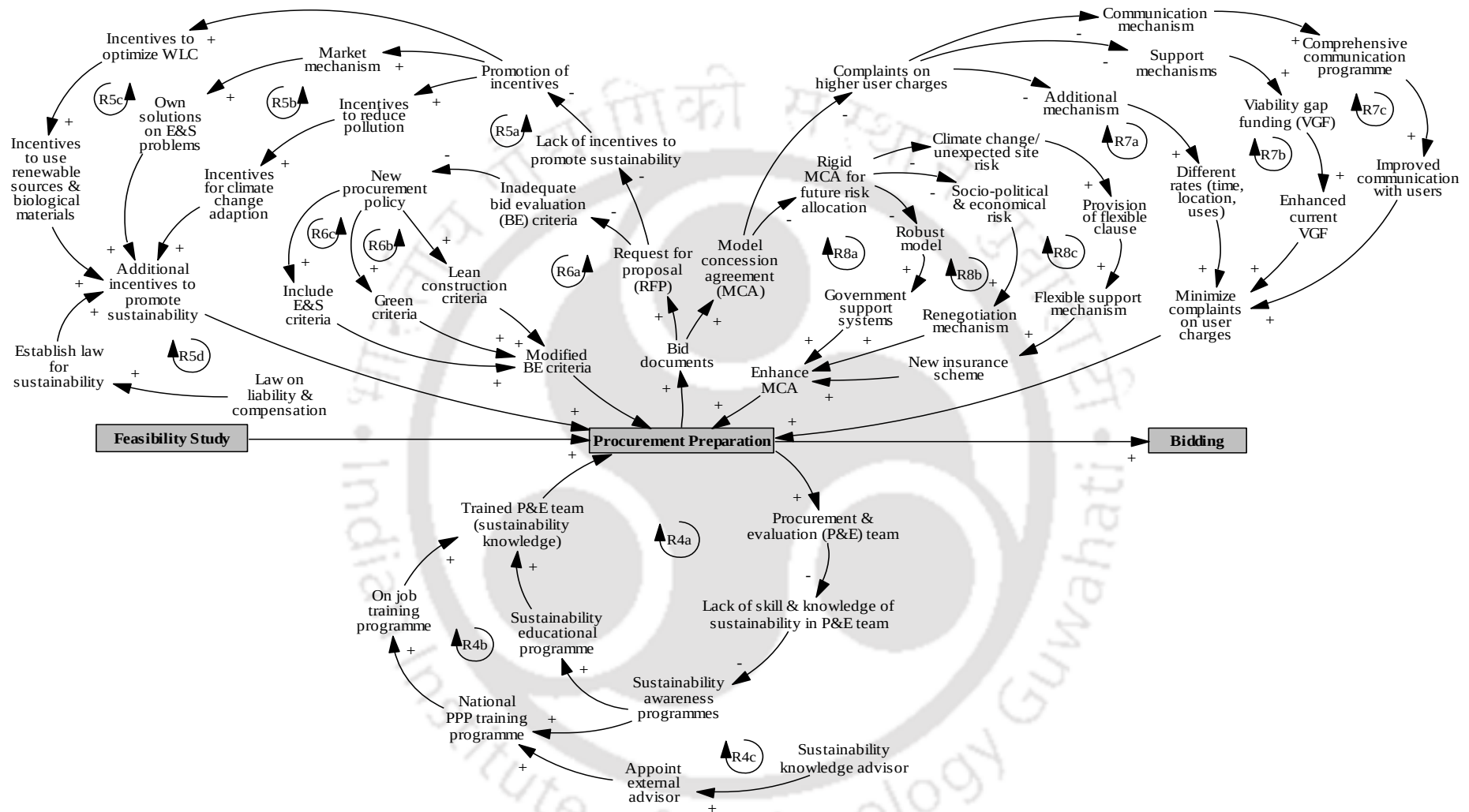


Figure 7.4: Modified system dynamics model to enhance the procurement preparation

7.5.3 Bidding process and contract finalization

The bidding process has been critical for lack of transparency and accountability in bidding, and high transaction and bidding cost of the project. Similarly, the respondents have also confirmed about goal conflicts between public and private sector. The implications of these issues have already been shown using balancing feedback loops (B9, B10, and B11) in Figure 7.2. For improving the system dynamics behavior of bidding process and contract finalization, the respondents have suggested six strategies to overcome the identified sustainability issues.

In order to optimize the bidding and transaction cost, the respondents have suggested three strategies. The first strategy relates to introduction of probity arrangement by appointing a probity advisor who would be interacting consistently with the bidders during the tendering process. Introduction of relational contacting (RC) approach has been the second strategy suggested by them as this will help in enhancing the trust and reputation of the bidders during the bidding. The third strategy is to introduce the flexibility in the preparation of the entire master plan for the project so as to promote innovative bid and design by the private sector. Integration of these three strategies helps in improving the system dynamics behavior of bidding process with the improvement highlighted by the formation of positive or reinforced feedback loops R9a, R9b, and R9c in Figure 7.5.

Another sustainability issue in bidding process is regarding lack of transparency and accountability during bid evaluation and to overcome these issues three strategies have been suggested by the respondents. One of the strategies has been to develop a strategic communication plan as part of the procurement policy to conduct the bid evaluation proceeding in an effective and transparent manner. The second strategy has been to appoint an independent scrutiny or supervisory body for scrutinizing the bidding process in order to see whether the policy objectives have been fulfilled or not. Appointment of fairness and process auditor as the third party expert in order to give an assurance to sponsors, bidders, and public sector that bidding process has been conducted in a fair, equitable and appropriate manner. The inclusion of these three strategies improves the system dynamics behavior of bid evaluation with bidding process through development of reinforced feedback loops R10a, R10b, and R10c in Figure 7.5.

Goal conflicts between public and private sector during finalization of contract agreement is another sub-deliverable of contract finalization that has been critical from sustainability

ynamics behavior has been highlighted through positive or reinforce feedback loop R11b in Figure 7.5.

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7.6 Summary

A qualitative system dynamic model using CLDs has been developed for assessment of causal behavior amongst the deliverables, conceptual areas, and strategies of PPP procurement process of India. The model has been developed through three chronological stages of conceptual, preliminary and modified system dynamics model development. Initially, the conceptual system dynamics model of CLDs explores the relationship between the deliverables of PPP procurement process in India. The four deliverables that play a major role in execution of PPP procurement process are feasibility study, procurement preparation, bidding process and contract finalization. These deliverables have proved to play a major contribution in PPPs development as displayed by the development of positive or reinforced feedback loop amongst each other in the conceptual model. The preliminary system dynamics model highlights the sustainability issues in those four key deliverables. The preliminary model also shows the failure to accomplish the requirements of sustainability principles relating to the eleven sub-deliverables of PPP process. The sub-deliverables are: Failure of socio-ecological system integrity in EIA and bid evaluation; Inefficient resource utilization in VfM analysis; Failure of socio-ecological civility and governance in stakeholder management; Inadequate precautionary and adoption measures in MCA; Intra-generational inequity and lack of livelihood sufficiency in user charges, and bidding & transaction cost. It has been observed from the preliminary system dynamics model that the sub-deliverables are negatively correlated with the key deliverable of PPP process as shown by the development of negative or balancing feedback loops. Finally, the modified system dynamics model was developed using focused interviews data to validate the occurrence of sustainability issues and feasibility of the strategies for enhancement of PPP procurement process. The modified system dynamics model has elaborated that inclusion of strategies will help in enhancement of key deliverables of PPP procurement process.

CHAPTER 8

VALIDATION OF FRAMEWORK

8.1 Introduction

Validation is an important process to ensure the quality of the research outcomes. This is normally undertaken as the final stage of the research work. In order to validate the framework developed from this research study, a survey via email was conducted with the same respondents who had participated earlier in the focused interviews during the development of a final framework. This chapter presents the findings of the validation of the framework developed from this study. The chapter has been divided into five sections. Second section explains the research method used for validation, while the email based survey protocol adopted for the study is the third section. Finally, the results of the validation exercise and the chapter's summary are presented in fourth and fifth section, respectively.

8.2 Research Method for Validation

Validation of the framework for enhancing the sustainability of PPP procurement process for infrastructure development in India aimed at determining whether the framework is appropriate, objective, reliable and practical. In order to validate the framework, a survey through e-mail questionnaire has been applied using various validation aspects. Meho (2006) mentioned that the e-mail interviewing offers unprecedented opportunities for qualitative research, which providing quick, convenient, and inexpensive access to participants, and can generate high-quality data when handled carefully. Therefore, the e-mail based survey approach has been adopted for the validation process. Furthermore, the validation method adopted for this study has been based on similar validation process conducted by Yeung (2007) and Cheung (2009) using six validation aspects. The six validation aspects are described in brief below:

- Degree of appropriateness – Assess whether the framework has included the appropriate strategy in the associated processes/activities of PPP procurement process.

- Degree of objectivity – Evaluate whether the framework has considered all the issues (shortfalls) in each phase of PPP procurement process from the perspective of sustainability.
- Degree of replicability – Assess whether the framework has reflected all the respondents' views on inclusion of each strategy in associated processes/activities of PPP procurement process.
- Degree of practicability – Evaluate the extent to which the framework has fulfilled the prerequisites of sustainability principles and extent of enhancement of sustainability of associated activity/process of PPP procurement process.
- Overall reliability – Appraise whether the overall framework, developed through the inclusion of various strategies in the associated processes/activities, would be maintaining the holistic triple bottom-line balance of sustainability throughout the identification, development, procurement, and management phases of PPP procurement process.
- Overall suitability for PPPs in India – Assess whether the framework, developed through inclusion of various strategies in associated processes/activities, would be appropriate for PPP procurement practices for infrastructure development in India.

8.3 Survey Protocol

The questionnaire template comprised of three sections (shown in Appendix 3). The first section highlights the purpose of the survey, background information about the research, and instructions for completing the surveys. A brief description about the final framework has been provided in the second section. The third section focuses on the framework validation scoring sheet along with the guideline for validation. Using the scoring sheet, the respondents were asked to rate the extent of satisfaction for each of the six validation aspects on the basis of a scoring scale of 1 to 5, where 1 represented 'poor' and 5 represented 'excellent'. The survey with 18 respondents were conducted during August to September 2015. The details of the respondents who had participated in the focused interview are attached in Appendix 3.

8.4 Results of Validation

The descriptive statistics derived from the statistical analysis of the responses provided by the respondents who had participated in the validation study for each validation aspect are shown in Table 8.1.

Table 8.1: Interview results for validation of framework

Respondents	Validation aspects					
	Degree of appropriateness	Degree of objectivity	Degree of replicability	Degree of practicality	Overall reliability	Overall suitability for PPPs in India
FI1	4	4	4	5	4	5
FI2	2	2	2	2	3	2
FI3	4	4	4	4	5	4
GS1	5	5	5	4	4	4
GS2	5	5	4	3	4	4
GS3	4	3	4	4	3	4
GS4	5	5	5	5	5	4
PS1	5	5	4	4	5	4
PS2	5	5	4	4	5	3
PS3	4	4	3	3	4	4
PS4	4	3	2	2	2	2
PS5	4	5	3	4	4	4
TA1	4	5	4	5	4	4
TA2	4	4	3	2	2	2
TA3	4	4	3	4	5	4
TA4	3	4	2	2	3	3
TA5	4	5	4	4	4	4
TA6	4	4	3	4	4	4
Mean	4.11	4.22	3.50	3.61	3.88	3.61
Mode	4.00	5.00	4.00	4.00	4.00	4.00
Median	4.00	4.00	4.00	4.00	4.00	4.00

[Acronyms used in the Table: FI – Financial Institutions; GS – Government Sector; PS – Private Sector; and TA –Transaction Advisors]

All the validation aspects have been rated highly by all the respondents. The mean values relating to the various validation aspects of the framework are 4.11 for degree of appropriateness, 4.22 for degree of objectivity, 3.50 for degree of replicability, 3.61 for

degree of practicality, 3.88 for overall reliability, and 3.61 for overall suitability for PPPs in India. Like the mean values, the modal and median values also indicate that the framework has been rated highly (at least 4) by the respondents on the six validation aspects.

8.5 Summary

Validation of the final framework has been conducted using email-based survey with the same eighteen experts who had earlier participated earlier in the development of the framework. The framework was examined to assess the extent of fulfilment of the six validation aspects. The respondents were asked to rate the framework on the basis of the six validation aspects using a five point Likert scale. It has been observed from the statistical analysis of the responses that the respondents have rated highly the framework in terms of the six validation aspects. The minimum value of the mean was around 3.5 and 4.0 for mode and median. The descriptive statistics (mean, mode and median values) of the responses were varying between the limits of minimum 3.5 and maximum 4.0. Based on these findings, it could be construed that the newly developed framework to enhance the sustainability of PPP procurement process is appropriate, objective, replicable, practical, reliable, and suitable for delivering PPP projects in India. This framework will enable practitioners and policy makers to restructure the current PPP procurement process to achieve sustainability goals.

CHAPTER 9

CONCLUSIONS AND RECOMMENDATIONS

9.1 Summary of the study

The current study has been conducted to develop the framework for enhancing the key deliverables of the Indian PPP procurement process from sustainability perspective. The framework of strategies developed in this study, based on finding from a secondary data source of literature review and corroboration with the primary data source of stakeholders' perspectives from the financial institution, the private sector, transaction advisors and government, served as the unit of analysis that were classified under various conceptual areas by 18 experts. In addition to this, the study has used system dynamics modeling using CLDs to assess the causal behavior of strategies and conceptual areas with the deliverables of PPP procurement process. Lastly, the applicability of the framework has been validated with respect to six validation aspects through survey with the 18 experts who had participated in the focused interviews.

9.2 Major findings

In order to achieve the research objective of the study, the five research stages have been adopted to development the final framework. The key conclusions that have been drawn from each of the research stage are shown below:

- Although the PPP procurement process for infrastructure projects has an innovative mechanism to evaluate whether the PPP route is leading to VfM, but the performance of PPPs has been criticized on sustainable development front. In order to deal with this argument, the present study has used empirical analysis to systematically identify the shortfalls in PPP procurement processes from the perspective of sustainable development. The study concludes that these shortcomings in the PPP procurement process have hindered accomplishment of the prerequisites of sustainable development principles. These shortcomings have resulted in inefficient promotion of sustainability aspects in the key deliverables of the PPP procurement process. Further, the study also highlighted through system dynamics modeling using CLDs that these shortfalls are

negatively correlated with respective deliverables, indicated by the development of negative or balancing feedback loops.

- Various organizations and researchers have established the principles of sustainability as core principles for sustainability, but these principles have been framed mostly as an abstract and vague statement. To make the principles of sustainability meaningful and expressive, the study has introduced the concept of guiding principles through empirical analysis for guiding specific decisions to accomplish sustainability of infrastructure projects. Through the empirical analysis, the study concludes that these guiding principles are descriptive in nature that can be easily operationalize for sustainability assessment of infrastructure development related activities and policies. Further, the mapping of guiding principles with core (Gibson's) principles and three dimensions of sustainability has also confirmed that all the guiding principles satisfy the core principles of sustainability and triple-bottom-line balance.
- In order to overcome the shortfalls and to promote sustainable infrastructure development through PPPs, there is a need for formulation of strategies to integrate principles of sustainability in the current PPP procurement process. In order to deal with this argument, a framework for integrating the principle of sustainability/guiding principles in respective deliverables or conceptual areas of PPP procurement process has been developed. The study concludes that the inclusion of these strategies in respective deliverables or conceptual areas would help in enhancement of related deliverables of the PPP procurement process from sustainability perspective. Furthermore, the study has also indicated through the system dynamics modeling using CLDs that the inclusions of these strategies in respective conceptual areas or deliverables have improved the system behavior of key deliverables positively as highlighted by development of positive/reinforced feedback loops.
- The study has validated the applicability of the framework for inclusion of strategies in the respective shortfalls or conceptual areas of PPP procurement process as highlighted by the accomplishment of six key validation aspects such as appropriateness, objectivity, replicability, practicability, reliability and suitability for PPPs in India.

9.3 Research implications

The present research has elaborated the following implications for various stakeholders of PPPs such as academic researchers, and industry professionals.

- The policy-makers and advisors of PPP projects from developing and developed countries could incorporate the key findings (i.e. formulated strategies) from this study in restructuring of PPP process for developing more sustainable PPP projects.
- The guiding principles developed through this research could become a better tool for the public and private sector to assess the sustainability of PPP infrastructure projects. These guiding principles act as a guideline to facilitate promotion of sustainable practices at various stages of infrastructure project so that sustainable development goal can be achieved over whole life cycle of the project.
- The qualitative analysis along with the appropriate tools and techniques, and the tactics applied in each stage of qualitative data analysis would be of interest to researchers and professionals in extensive analysis of qualitative data in NVivo. The process adopted in this study could be satisfactorily replicated by other researchers in development of grounded theory in the field of Construction Engineering and Management research and related research areas for qualitative data analysis.
- The study has elaborated the applicability of new approach in the form of guiding principles for sustainability assessment, tools and techniques for qualitative data analysis and NVivo for the development of grounded theory. This approach could be treated as an alternative educational tool for students to learn sustainability assessment, qualitative data analysis, and grounded theory development.

9.4 Limitations of the Current Study

Followings are the few limitations of the current study:

- The findings from this study have focused on PPP procurement practices in the context of infrastructure development in India.
- The objectives of the current study have been achieved through only two data sources include literature and interview with small sample size.
- The qualitative system dynamics modeling has been conducted in this study by using only a causal loop diagramming.

9.5 Scope of the Future Research

The study has scope for improvement so as to augment the findings and framework that has been developed from this study towards promotion of sustainable development goals even when infrastructure projects are developed through PPP route. Some of the areas which need to be subjected to further study are as follows:

- Evaluate feasibility of the framework in different contextual environment – Although the proposed framework of strategies has been developed by the experts involved in development and implementation of PPP practices for infrastructure development in India, this framework will require further investigation in another contextual environment of different countries to increase its usefulness and enhance the applicability for practitioners.
- Verify the applicability of framework by conducting a few pilot case studies of PPP projects – The applicability of the framework would need to be established through action research by conducting a few pilot studies to assess the implication of integrating the suggested strategies.
- Using case study research as an investigation approach – Investigation at project level should be conducted using other qualitative research approach like case study research approach to identify additional or project specific strategies for achieving the sustainable development goals for infrastructure development.
- Using simulation technique through quantitative system dynamics modeling – The present study has defined the interrelationships between suggested strategies and deliverables of PPP procurement process through development of qualitative system dynamics model using CLDs. However, the model has not been subjected to further study to explore the qualitative relationship amongst the variables. To optimize the dynamics behavior of the PPP procurement process, further study could be carried out to study the quantitative system dynamics modeling using simulation technique.
- Evaluate the feasibility of the guiding principles in another contextual environment – These principles should be validated in the contextual environment of other countries to enhance its usefulness and enhance the applicability for practitioners, as the framework was developed with the assistance of experts involved in PPP projects in India only.

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Appendix 1: Focused Interview Template

INVITATION LETTER TO PARTICIPATE IN FOCUSED INTERVIEW

Mr. Nilesh Agarchand Patil

Ph.D., Research Scholar

Infrastructure Engineering and Management Division

Department of Civil Engineering

Indian Institute of Engineering Guwahati

Guwahati - 781039

Dear Sir/Madam

Subject: Request to participate in focused interview

I am currently pursuing Ph.D. in Infrastructure Engineering and Management Division of Department of Civil Engineering at Indian Institute of Technology Guwahati. The main objective of my doctoral work is to establish a “Framework for enhancing the sustainability of PPP procurement process”. The framework will comprise of strategies to integrate the principles of sustainable development in the PPP project procurement process. These strategies have been formulated to overcome the shortfalls in PPP project procurement process, identified through content analysis of practices being implemented in India.

I would like to take this opportunity to invite you to participate in this study. Your valuable inputs are required to get an insight into the PPP procurement process since you have been involved and associated with the development and implementation of PPP projects.

As part of this study, we would like to conduct an interview with you, which will take not more than 40 – 50 minutes. Necessary guidelines have also been provided to facilitate the interview process.

We would like to assure you that information shared with us will be treated highly confidential and its use is intended for academic purpose only. The interview template is enclosed herewith as a guideline.

Thank you in advance for your time and help in undertaking this research.

Yours sincerely,

Mr. Nilesh A. Patil

(Research Scholar)

Dr. L. Boeing Singh

(Research Supervisor)

SECTION I: DEMOGRAPHIC INFORMATION OF RESPONDENTS

(Note: All information provided will be treated strictly confidential and no information regarding any individual respondent or organization will be made public)

Guideline: The aim of this section is to identify the respondent's background information. Please provide the following information.

1. Professional information

- a. Name of the Expert :-
- b. Organization :-
- c. Position in the Organization :-
- d. Contact Phone/Cell No. :-
- e. Email Address :-

2. Educational qualification (please tick/underline any that apply)

- ☐ Undergraduate degree ☐ Postgraduate degree ☐ Postgraduate diploma
- ☐ Doctorate ☐ Other (please specify):

3. Representing which stakeholder in PPP infrastructure projects (please tick/underline any that apply)

- ☐ Public Sector ☐ Private sector ☐ Financial Institution
- ☐ Transaction Advisor ☐ NGO ☐ Research/Academics

4. Professional background with specialization in PPP infrastructure projects (please tick any that apply)

- ☐ Civil Engineering ☐ Economics ☐ Management
- ☐ Environmental ☐ Finance ☐ Social Science
- ☐ Other (please specify):

5. Years of experience in PPP infrastructure projects (please tick/underline any that apply)

- ☐ Less than one Year ☐ In between 1-5 Years ☐ In between 6-10 Years
- ☐ In between 11-15 Years ☐ In between 16-20 Years ☐ More than 20 Years

6. Experience in which types of PPP infrastructure sector (you may select more than one box)

- ☐ National/State Highways ☐ Energy and Power ☐ Aviation
- ☐ Urban Water Supply ☐ Urban SWM ☐ Urban Waste Water

☐ Other (please specify):

7. **Experience of numbers of PPP infrastructure projects developed** (please tick any that apply)

☐ In between 1-5 Numbers ☐ In between 6-10 Numbers ☐ In between 11-15 Numbers

☐ In between 16-20 Numbers ☐ In between 21-25 Numbers ☐ More than 25 Numbers

8. **Associated in which phase of PPP procurement process** (you may select more than one box)

☐ Phase 1: Project Identification ☐ Phase 2: Project Preparation

☐ Phase 3: Project Procurement ☐ Phase 4: Project Management & Monitoring

9. **Specify geographic location of your workplace in India** (please tick/underline any that apply)

☐ South India ☐ West India ☐ North India

☐ East India ☐ North-East ☐ Central India

(Continue to next section II)

SECTION II: SUSTAINABILITY PRINCIPLES FOR PPP PROCESS

Guidelines: It is of the notion that development of infrastructure projects through PPP route will be considered to be sustainable if and only if, “the necessity and acceptability of the project is in line with interest of society, adopting cleaner technologies and innovation such that it not only generates revenue and brings economic benefits to various stakeholders (private sector, public agency, and people) but it is also eco-friendly in terms of the impact, utilizing minimum possible resources for its construction, operation and maintenance and is implemented through a quicker and appropriate procurement process”.

To achieve the sustainable development with respect to social, environmental and economic dimension, there is a need to design and develop the PPP procurement process for infrastructure projects to accomplish the sustainability principles mentioned below. Please give your valuable suggestion on appended questions.

Questions:

1. Have you ever dealt with the aspect of sustainability in the development and implementation of PPP infrastructure projects? If yes, then how?
2. What does the word sustainable PPP procurement process for infrastructure project mean to you?
3. Do you agree that below-mentioned principles are sufficient to promote and incorporates principles in PPP procurement process? Do you want to make a further addition of some other principles to make PPP procurement process progress towards sustainability?

PRINCIPLES	SUGGESTION (Please mark- ✓)
Environmental protection: Protecting, preserving and restoring the natural environment and maximizing environmental benefits while reducing or eliminating negative environmental impacts.	
Polluters pay: Take responsibility for any harm cause to the environment and compensate those persons who are adversely affected.	
Balance risk allocation: A successful contract is the one which balance the risk between the Government and the operator or private partner.	
Adaptability and resilience: Ability to adapt to the changing needs of the society over time considering the future growth of the city.	
Precautionary: Take a precautionary approach where there is uncertainty in order to avoid potential damage to people’s health or to the environment and take preventive action.	

PRINCIPLES	SUGGESTION (Please mark- ✓)
Quality of life: Develop local skill & capability; enhance public health and safety; minimize noise; improve community mobility and accessibility; and preserve culture and heritage.	
Creativity and promote innovation: Encourage for innovative solutions to problems in project development; and share the important information & knowledge with sub-ordinates.	
Up gradation of knowledge: Promote education and public awareness of sustainability through higher education, training, participation and awareness programs.	
Affordable user charges: To providing public services to segments of society that are normally excluded, such as the poor, migrants, lower castes, or tribal people.	
Intra-generational equity: Improving the well-being of all residents in a community, and not just benefiting the powerful or the rich.	
Inter-generational equity: There should also be an equitable distribution of resources between and among communities and future generation to enjoy an acceptable quality of life.	
Long term strategic planning: Ensures that the long-term integrity and productivity of our economy, our environment, our natural resources and safeguards our human health.	
Maintenance of natural resources: Use a maximum of renewable natural resources and conserve non-renewable natural resources through efficient use and careful planning.	
Value for money: Improvement, quality, cost and access to infrastructure, and ensuring the financial viability of infrastructure at minimum cost to Government.	
Efficient project delivery: Developing and following proven best practices in budgeting, scheduling, contract and asset management, and returns can be substantively improved.	
Public participation: Engagement of stakeholders to bring their different views, perceptions, knowledge and skills to bear on the challenge being addressed.	
Transparency and accountability: Setting clear standards, ensuring monitoring, and practice fairness and transparent to be responsible for our decisions.	
Strong organization and leadership: Each organization must establish clear plans & rules for service provision; regulate and monitor service quality; coordinate infrastructure project development; and deliver services efficiently and equitably.	
Multidimensional: Three dimensions of sustainable development (social; economic; environmental) are interrelated and must be simultaneously addressed to meet the needs of current and future generations.	
Continuum: Promote coherence between all government policies and coherence between local, regional, national and global actions in order to increase their contribution to sustainable development.	
Any other principle (s)	

(Continue to next section III)

SECTION III: EVALUATE THE SHORTFALLS AND THE STRATEGIES

Guidelines: This section helps us to evaluate the identified shortfalls, which hamper the sustainability of PPP procurement process. Further, we would like you to validate the strategies that fulfill the requirement of sustainability and manage the respective shortfall in PPP procurement process. Below three questions that are related to evaluating shortfalls and validate strategies respectively for each shortfall listed below. Please give in your valuable comments for each below listed set through following three questions.

- (1) Whether the current shortfall hampered the sustainability of PPP procurement process? If yes then how?
- (2) Whether the strategies listed below for each shortfall will fulfill the requirement of sustainability? If yes then how?
- (3) Please suggest further shortfalls & strategies, which are not considered in the below set? Give the reason for the same?

Set 1: Inadequate environment impact assessment(EIA) and social impact assessment (SIA)

Shortfall: Current EIA and SIA activities for pre-feasibility and feasibility study are inadequate in ensuring the promotion of project outcomes that are sustainable. EIA focuses all too often on acceptable impacts instead of optimizing the project for environmental, social and community benefits. As per the procurement process, many decisions relating to the design and operation of the project that influences the environmental performance of the project are made after the EIA.

Strategies:

1. Incorporate environmental and social considerations into policies, plans and programs of PPP project identification through strategic environmental assessment (SEA).
2. Include the assessment of climate change considerations (GHG emission from project and climate change impact on the project) into EIA of PPP project identification and development.
3. Install and implement environmental-friendly and smart-growth technique in the design of PPPs for contribute towards biodiversity conservation e.g. Green design through LEED, CEEQUAL, BREEAM (rating tools).
4. Early participation of financial institutions (FIs) through adoption of the equator principles (EPs) for determining, assessing, and managing environmental and social impacts of PPP projects
5. (Suggest, if any further strategy)

Set 2: Inadequate whole life costing (WLC) methodology for value for money (VfM) estimation

Shortfall: Whole life costing (WLC) methodology does not consider environmental and social externalities, and cost savings in VfM estimation. Risk model used in VfM analysis is very simple and outdated; and it fails to model the complex risk/reward profile of PPP project.
Strategies: 1. Include environmental and social costs, and benefits (i.e. green accounting) in WLC estimation for VfM analysis through promoting to use renewable energy sources and cost effective technologies. 2. Include climate change parameters, and long term social and environmental impact in risk model of VfM estimation. 3. Adopt a life cycle assessment (LCA) approaches using a materials calculator to quantify and compare materials lifecycle impacts and also recognizes the use of materials that have environmental labels. 4. Employ independent assessor with knowledge of sustainability to assess or check the VfM estimation estimated by the public sector with respect to sustainable development. 5. (Suggest, if any further strategy)
Set 3: Lack of Incentives to private sector to use energy efficient systems
Shortfall: There are little incentives to private sector to use energy efficient systems in construction and operation of project facilities. OR The right sets of incentives are not provided to the private sector to invest, innovate and provide optimum solutions that will promote sustainable development while structuring the PPP model.
Strategies: 1. Provide incentives and subsidies to the private sector for optimizing WLC of the project through bid invitation by promoting to use renewable energy sources and biological materials. 2. Establish the incentive structures, including market mechanisms will be feasible to maximize benefits or minimize costs to develop their own solutions and responses to the environmental problems. 3. Introduce incentives for adaption and mitigation of climate change strategies, like reducing the emission of greenhouse gasses (GHGs) and minimizing energy use through design, efficient operation and fuel substitution or it also recognizes the use of GHG offsets. 4. Establish a law regarding liability and compensation for those persons who are adversely affected by pollution or who is creating the pollution. 5. (Suggest, if any further strategy)
Set 4: Inadequate bid evaluation criteria for PPP procurement
Shortfall: Current bid evaluation criteria are in financial terms only, the private player tends to focus on maximizing returns and recover the investment cost by making crucial changes in the project. The procurement process of PPP project should embed environmental and social safeguards/dimensions in their tender evaluation, supplier selection, and monitoring and contracting functions.

Strategies:

1. Promote green procurement through enhancement of procurement policy to invite that bid which uses innovative technologies to reduce pollution, climate change mitigation, and recycle of waste.
2. Include the social and environmental criteria in bid evaluation through promoting private partners which complying the requirement of an 'Equator Principles' to assess the social and environmental impact on the project.
3. Include additional bidding criteria to promote utilization of energy efficient systems and various management techniques such as lean construction to minimize construction and operation and maintenance related wastes.
4. (Suggest, if any further strategy)

Set 5: High bidding and transaction cost of PPP procurement preparation

Shortfall: The current bidding and transaction cost of PPP procurement preparation is six time higher than that of traditional procurement practice due to the lengthy negotiations in bidding process. Also, PPP projects engage professional services, which are highly costly, for structuring project deals.

Strategies:

1. Introduce the concepts of trust and reputation of relational contracting (RC) in order to minimize procurement transaction costs through integrating principles of RC in PPP contract; and optimizing the necessarily long term contractual arrangements of PPPs in particular.
2. Interacting effectively with bidders during the tender process, consistent with appropriate probity arrangements (confirmed integrity and honesty) through probity advisors for procurement.
3. Flexibility to private sector for preparation of entire master plan for the project so that it promotes innovative and competitive bids.
4. (Suggest, if any further strategy)

Set 6: High tariff charges for infrastructure services

Shortfall: One of the most common complaints by the general public against PPP projects are the high tariff charged for the services provided by private sector. High tariff will make certain section of the society inaccessible to the infrastructure services and will fail to provide equal opportunity for growth and increase the gaps between the rich and poor.

Strategies:

1. Arrange comprehensive communication program to educate the public users about the necessity of improved services, as the new service saves their time and cost (Awareness through value analysis).
2. Enhance current government payments support system like VGF in India, which is currently limited to 40% of the total project cost. In countries with lower demand growth prospects, a higher viability-funding cap may be necessary.

3. Implement institute differentiated rates, specifically, adjust charges according to time, location and usage. 4. (Suggest, if any further strategy)
Set 7: Lack of skill and knowledge about sustainability concepts in key actors
Shortfall: Though the procurement process has been streamlined to a large extent but the key actor's involved in PPP procurement lack the requisite skill and knowledge about sustainability concepts as applied to infrastructure development. In addition, the procurement and evaluation team also do not normally have the inclination to encourage the innovative solutions from private sector that deliver sustainability.
Strategies: 1. Early involvement of specialized sustainability advisors for consultation in order to help the contracting authorities ensure that sustainability considerations will be consistently included in PPPs. 2. Develop strategies for attitude change, including education and awareness raising and ensuring decision making processes that give conscious attention to environmental and social objectives. 3. PPP unit should establish national PPP training programs to build the expertise of government officials, which include practical 'on-the-job training' as opposed to theoretical classroom lecturing. 4. (Suggest, if any further strategy)
Set 8: Goal conflict between private sector and public authority
Shortfall: The goals of the private sector fundamentally oppose those of the public sector: the former focuses on financial gain while the latter strives to protect the public interest through regulation and minimization of risk. As a result, the actors representing the private sector focus on the financial aspects of the projects and this aspect is also given higher priority by public authority in order to make the project attractive to private sector as they need additional capital for building the much needed infrastructure.
Strategies: 1. The enunciation of a legal act/policy on the part of the government that allowed for private participation in infrastructure and identified sectors where PPPs could be investigated as first-choice options for project procurement, which likely provide confidence to private players to participate on PPP projects. 2. Establish the public-private interaction forums to understand each other better, own their shortcomings, hold open discussions, and work through issues that come up during the course of the project. 3. (Suggest, if any further strategy)
Set 9: Lack of transparency and accountability during bidding
Shortfall: The public disclosure of concession agreement has been made mandatory as per the model concession agreement (MCA) but the details relating to project financing are not publicly accessible since the private sector data on profits, costs, or lessons learnt are considered issues

of commercial confidentiality by them. In addition to the lack of transparency by public sector in bid evaluation and decision making process lacks the involvement of the non-government and non-market groups.

Strategies:

1. Strategic communication plan should be part of policy that explains the benefits of the program and can prevent the discussion from being defined by PPP critics, within the media and elsewhere.
2. The institutional infrastructure requires bodies that can independently scrutinize projects after they have been signed in order to determine whether or not policy objectives have been met.
3. Appoint 'fairness and process auditors' as a third party independent experts, which provides a level of assurance to government sponsors, bidders and the public that the procurement process will fair, equitable, and appropriate .
4. (Suggest, if any further strategy)

Set 10: Lack of stakeholder's participation and public opposition in development stage of PPP process

Shortfall: Public opposition has been reported as the main reason for failure of PPP projects in several instances. The main reasons for such failure, which are primarily connected with stakeholder's lack of awareness in the concept of PPP; insufficient education about PPP; and being denied access to detailed information contained in the consortium's PPP proposals.

Strategies:

1. Establish a special purpose company (SPC), jointly owned by government, users and private developers as an institutional mechanism for development of projects.
2. Adoption of building information modeling (BIM) system for better communication tool for stakeholder's participation in decision making and provide greater clarity for all stakeholders across the project lifecycle.
3. Encouraging community involvement through partnering between urban local bodies (ULBs) or local community-led NGO can play a key role in convincing the community on the benefits of PPP project.
4. (Suggest, if any further strategy)

Set 11: Rigid model concession agreement (MCA) related to future unforeseen risk

Shortfall: The underlying norms of risk transfer and compensation for PPPs will need to be changed so that it can effectively serve as tools for sustainable development. The current MCA is more rigid contracts and it will be very difficult to government to structure contract that take into account future unforeseen events or circumstances wherein the contractual responsibilities can change and adapt as context changes.

Strategies:

1. Include the clause in MCA for sharing of costs of unusual site risks due to future unexpected climate change impact on project and hazardous materials discovered on project site through proper insurance mechanism.

2. Include renegotiation mechanism through hierarchical contracts in MCA to address socio-political or economic changes which could be handled through inflexible contract model.
3. Government need to be prepared to pay for the additional financing cost associated with a more robust financing structure, which would manifest in higher service payment or government capital contribution.
4. (Suggest, if any further strategy)

Thank you for taking the time to assist me in my educational endeavors.

Yours sincerely,

Mr. Nilesh A. Patil (Research Scholar)

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(Thank you for your time and support)



Appendix 2: Respondents Participated in Focused Interview

[A] Pilot Study

Sr. No.	Code	Designation of the Respondent	Working sector with location in India
1.	PGS1	Executive Engineer	Guwahati Municipal Corporation, Guwahati
2.	PGS2	Project Engineer	GMDA, Guwahati
3.	PPS1	Sr. Engineer	TRIL Roads Pvt. Ltd., Guwahati
4.	PPS2	Manager, Projects Planning	Gammon India Ltd., Guwahati
5.	PTA1	Senior Manager	IL&FS Infrastructure Ltd., Guwahati
6.	PTA2	Director	Project Engineers, Guwahati

[B] Main Study

Sr. No.	Code	Designation of the Respondent	Working sector with location in India
1.	FI1	Senior Vice President	SBI Capital Markets Limited, Kolkata
2.	FI2	PPP Expert, WB	The World Bank Group, New Delhi
3.	FI3	PPP Expert, ADB	Asian Development Bank, New Delhi
4.	GS1	Executive Engineer	PWD, Pune
5.	GS2	Chief General Manager	FA & PPP, NHAI, New Delhi
6.	GS3	Project Officer, PPP	NITI AAYOG, New Delhi
7.	GS4	PPP Expert, PPP Cell	PPP Cell, P&D, Kolkata
8.	PS1	Senior Manager	IVRCL Infrastructure Projects Ltd., Pune
9.	PS2	Manager, Projects Planning	Gammon India Ltd., Kolkata
10.	PS3	Sr. Manager, Contracts	TRIL Roads Pvt. Ltd., Pune
11.	PS4	Ex. Director	Consulting Engineers Group Ltd., New Delhi
12.	PS5	Ex. Director	LEA Associates Pvt. Ltd., New Delhi
13.	TA1	Director	Transbiz Associates Pvt. Ltd., Gurgaon
14.	TA2	Assistant Vice President	IL&FS Infrastructure Ltd., New Delhi
15.	TA3	Director	JACOBS, Pune
16.	TA4	Senior Vice President	Grant Thornton (India), New Delhi
17.	TA5	Manager	Urban Infrastructure Finance, IMACS, Pune
18.	TA6	Legal Advisor, PPP	Abacus Legal Group, New Delhi

[**Acronyms:** FI – Financial Institutions; GS – Government Sector; PS – Private Sector; and TA – Transaction Advisors]



Appendix 3: Survey Template

Section 1: Background Information and instructions for validation process

Purpose of the interview: To validate that the framework for enhancing the sustainability of PPP procurement process for infrastructure development in India is comprehensive, objective, reliable and practical.

Background: This framework was developed as part of the Ph.D. research study conducted at the Indian Institute of Technology Guwahati in India by Mr. Nilesh Agarchand Patil.

Instructions: This document consists of three sections. First section (current page) includes background information and instructions for validation process. Second section explains the tabularize framework of strategies to be included for enhancing the sustainability of associated activities/process and deliverables of PPP procurement process in India. The framework has been developed through focused interviews with the PPP expert's involved in the development and implementation of PPP projects in India. These focused interviews were carried out during the period October 2014 to February 2015 and your valuable insights were obtained through these focused interviews. The last section deals with the validation of the framework from the perspective of following six validation aspects. You are kindly requested to rate the six validation aspects by simply selecting the appropriate boxes.

- (i) Degree of appropriateness
- (ii) Degree of objectivity
- (iii) Degree of replicability
- (iv) Degree of practicality
- (v) Overall reliability
- (vi) Overall suitability for PPPs in India.

Your kind assistance in completing this questionnaire is very much appreciated. Please kindly return the completed form to Mr. Nilesh Agarchand Patil by email on or before 30 September 2015.

Thank you in advance for your kind contribution.

Yours sincerely,

Mr. Nilesh Agarchand Patil (Research Scholar)

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Dr. Laishram Boeing Singh (Research Supervisor)

Email: boeing@iitg.ernet.in

Section 2: Framework for Enhancing Sustainability of PPP procurement Process

Strategies included to enhance the sustainability of PPP procurement process	Included in PPP process with	
	Process /Activity	Deliverable
Environmental & social (E&S) considerations into policy, plan & program through strategic environmental assessment	Environmental impact assessment (EIA)	Feasibility Study
Assessment of climate change considerations (GHG emission from project & climate change impact on project) into EIA		
Install environmental-friendly and smart-growth technique in design of PPPs (e.g. Green design through LEED, BREEAM)		
Establish special purpose company jointly owned by government, users and private developer	Social impact assessment (SIA): Stakeholders participation	
Adopt building information modeling as an improved communication tool for stakeholders participation in SIA		
Community involvement through partnering with urban local bodies or local community leads NGOs		
Comprise E&S costs& benefits in WLC estimation through promoting cost effective technologies	Value for money (VfM) analysis	PPP due diligence study
Encompass climate change parameters & long term E&S impact in risk model of VfM estimation		
Adopt life cycle assessment approach using material calculator to quantify and compare material lifecycle impacts		
Employ independent assessor with knowledge of sustainability to assess or check the VfM estimation		
Participation of specialized sustainability advisor with P&E team to ensure sustainability considerations in procurement preparation	Skill and Knowledge of sustainability	Procurement preparation: P&E team
Develop strategies for attitude change through training & awareness raising that gives conscious attention to E&S goals		
Establish national PPP programs to build expertise of government officials, which includes 'on-the-job training'		
Incentives to private sector for optimize WLC of project through promoting to use renewable energy sources & biological materials	Incentives to private sector	Bid document: Request for proposal (RFP)
Establish market mechanisms to maximize benefits or minimize cost through develop their own solutions on E&S issues		
Introduce incentives for adaption and mitigation of climate change strategies, like reducing emission of GHGs		
Establish law regarding liability and compensation to those creating the pollution and affected by pollution respectively		
Promote green procurement to invite those bid which uses innovative technologies to reduce and mitigate pollution	Bid preparation and evaluation	Bid document: Request for proposal (RFP)
Include environmental and social criteria in bid evaluation through complying the requirement of equator principles		
Additional bidding criteria for promoting to use energy efficient systems to reduce construction wastes e.g. Lean construction		
Arrange comprehensive communication program to educate the users about improved services i.e. through value analysis	User charges	Bid documents: Concession agreement (CA)
Enhance current viability gap funding (VGF) mechanism, which is currently limited to 40% of the total project cost		
Implement institute differentiated rates mechanism, specifically, adjust charges according to time, location & usage		

Strategies included to enhance the sustainability of PPP procurement process	Included in PPP process with	
	Process /Activity	Deliverable
Include clauses in MCA to share a costs of unusual site risks due to future unexpected climate change impact on project	Risk allocation	
Renegotiation mechanism in MCA to address socio-political or economic changes though inflexible contract model		
Provision for additional finance from govt. for robust financing structure, which would manifest in higher service payment		
Flexibility in MCA for future unforeseen E&S issues and climate impact on project or any disaster		
Establish the aspects of trust and reputation of relational contracting (RC) through integrating of RC principles	Bidding and transaction cost	Bidding: Bid preparation & distribution
Interacting with bidder through probity arrangements of probity advisor to confirm integrity & honesty		
Flexibility to private sector for preparation of entire master plan to invite innovative & competitive bids		
Strategic communication plan should be part of policy that explains the benefits of PPP program	Transparency and accountability during bidding	Bidding: Bid evaluation
Institutional bodies that can independently scrutinize projects after they have been signed to verify policy objectives		
Appoint fairness & process auditors as a third party independent expert to give assurance on fairness of procurement process		
Early participation of private sector through articulation of a legal policy or act	Goal conflicts of public and private sector	Contract finalization: Contract agreement
Establish the public-private interaction forums to understand each other, hold open discussion & work through issues		

(Abbreviations: E&S – Environmental & Social; P&E – Procurement & Evaluation; GHGs – Green House Gases; WLC – Whole Life-cycle Cost; VfM – Value for Money; MCA – Model Concession Agreement; RC – Relational Contracting; EIA – Environmental impact assessment; SIA – Social Impact Assessment)

Section 3: Framework Validation Scoring Sheet

Guideline: Please select the relative score for each validation aspect below to represent the extent of satisfaction (1 represents “poor” and 5 represents “excellent”). The brief explanation of each validation aspect is as follows:

- **Degree of appropriateness:** Assess whether the framework has included the appropriate strategy in the associated processes/activities of PPP procurement process.
- **Degree of objectivity:** Evaluate whether the framework has considered all the issues (shortfalls) in each phase of PPP procurement process from the perspective of sustainability.
- **Degree of replicability:** Assess whether the framework has reflected all the respondents’ views on inclusion of each strategy in associated processes/activities of PPP procurement process.
- **Degree of practicability:** Evaluate the extent to which the framework has fulfilled the prerequisites of sustainability principles and extent of enhancement of sustainability of associated activity/process of PPP procurement process.
- **Overall reliability:** Appraise whether the overall framework, developed through inclusion of various strategies in the associated processes/activities, would be maintaining the holistic triple bottom-line balance of sustainability throughout the identification, development, procurement, and management phases of PPP procurement process.
- **Overall suitability for PPPs in India:** Assess whether the framework, developed through inclusion of various strategies in associated processes/activities, would be appropriate for PPP procurement practices for infrastructure development in India.

Sl. No.	Validation Aspects	Scoring Scale(Please Tick ✓ in appropriate box)				
		Poor			Excellent	
		1	2	3	4	5
1.	Degree of appropriateness					
2.	Degree of objectivity					
3.	Degree of replicability					
4.	Degree of practicality					
5.	Overall reliability					
6.	Overall suitability for PPPs in India					

INFORMATION OF THE RESPONDENT

Name of the Respondent or Expert:

Name of your organization:

Please state your primary role (i.e. public/private/consultant/lender):

(Thank you for your time and support)

Appendix 4: Publications from this Thesis

Journal Papers - Published

- Nilesh A. Patil, Tharun Dolla, and Boeing Laishram, 'Infrastructure development through PPPs in India: criteria for sustainability assessment', Journal of Environmental Planning and Management, Taylor and Francis Publication, Vol. 59, No. 4, 708-729, 2016. DOI: 10.1080/09640568.2015.1038337
- Nilesh A. Patil and Boeing Laishram, 'PPPs from the sustainability perspective: A critical analysis of Indian case', International Journal of Construction Management, Taylor and Francis Publication, Vol. 16, No. 2, 161-174, 2016. DOI: 10.1080/5623599.2016.1146113
- Nilesh A. Patil and Boeing Laishram, 'Sustainability of Indian PPP procurement process: Development of strategies for enhancement', Built Environment Project and Asset Management, Emerald Publication, Vol. 6, No. 5, 491-507, 2016. DOI: 10.1108/BEPAM-09-2015-0043.
- Nilesh A. Patil and Boeing Laishram, 'Sustainable infrastructure development challenges through PPP procurement process: Indian perspective', International Journal of Managing Projects in Business, Emerald Publication, Vol. 10, No. 3, 642-662, 2017. DOI: 10.1108/IJMPB-10-2016-0078

Journal Papers – Accepted for the Publication

- Nilesh A. Patil and Boeing Laishram, 'Framework to enhance sustainability of PPP procurement process: An Indian perspective', Journal of Sustainable Building Technology and Urban Development, Taylor and Francis Publication.
- Nilesh A. Patil and Boeing Laishram, 'Infrastructure development through PPPs: Framework of guiding principles for sustainability assessment', Handbook on Public-Private Partnerships in Developing and Emerging Economies, Emerald Publication.

Journal Papers – Ready for the Communication

- Nilesh A. Patil and Boeing Laishram, 'Qualitative data analysis for empirical studies in construction engineering and management research using CAQDAS'.

- Nilesh A. Patil and Boeing Laishram, 'System dynamics model for enhancing the sustainability of PPP procurement process in India'.

Conference Papers – Presented and Published

- Boeing Laishram and Nilesh A. Patil, 'Infrastructure development through PPP route: A review from sustainability perspective', International Conference on Renewable Energy and Sustainable Development, Organized by Trinity College of Engineering, Pune, January 9-10, 2014. (*Awarded as the 'Best Paper of the Session'*)
- Nilesh A. Patil and Boeing Laishram, 'Role of lenders in promoting sustainable development in PPP infrastructure projects', International Conference on Frontiers of Infrastructure Finance, Organized by Vinod Gupta School of Management, IIT Kharagpur, West Bengal, November 13-15, 2014.
- Nilesh A. Patil and Boeing Laishram, 'Framework of guiding principles for sustainable infrastructure development', 6th International Conference on Innovative Trends in Civil Engineering, Architecture and Environmental Engineering for Sustainable Infrastructure Development, Organized by Krishi Sanskriti, Conducted at JNU, New Delhi, January 24-25, 2015.
- Nilesh A. Patil and Boeing Laishram, 'Solid waste management through PPPs in India: sustainability perspective', Symposium on Management and Procurement of Integrated Waste Management System, Organized by Knowledge Incubation Cell, Centre for Education Technology and Department of Civil Engineering, IIT Guwahati, February 6-7, 2015. (*Only abstract published*)
- Nilesh A. Patil and Boeing Laishram, 'Strategies to enhance the sustainability of PPP procurement process for infrastructure development', The 4th World Construction Symposium, Sustainable Development in the Built Environment: Green Growth and Innovative Directions, Organized by The Ceylon Institute of Builders and Building Economics and Management Research Unit, Department of Building Economics, University of Moratuwa, Sri Lanka, Organized at Colombo, June 12-14, 2015. [URI: <http://dl.lib.mrt.ac.lk/handle/123/11253>] (*Awarded as the 'BEPAM Best Paper'*)
- Nilesh A. Patil and Boeing Laishram, 'Sustainability issues in PPP for infrastructure development in and around Guwahati region', Conference on New Frontiers in Civil Engineering: Challenges and Opportunities in North-East India, Organized by

Department of Civil Engineering, Royal School of Engineering and Technology, Guwahati, November 5-6, 2015.

- Nilesh A. Patil and Boeing Laishram, 'Sustainability of PPP infrastructure projects: Lessons from the Indian experience', National Conference on Advances in Construction Technology and Management, Organized by Department of Civil Engineering, VNIT, Nagpur, February 19-20, 2016.
- Nilesh A. Patil and Boeing Laishram, 'Sustainability of municipal solid waste management PPP infrastructure projects: Lessons from the Indian experience', International Conference on Waste Management, Organized by Department of Civil Engineering, IIT Guwahati, April 1-2, 2016. (*Only abstract published*)
- Nilesh A. Patil and Boeing Laishram, 'Sustainability issues in PPP procurement process for infrastructure development: System dynamics approach', PMI Project Management Research and Academic Conference 2017 on 'Accelerating Development: Harnessing the Power of Project Management', Organized by PMI India at IIT Delhi, New Delhi, March 2-4, 2017.
- Nilesh A. Patil and Boeing Laishram, 'Qualitative content analysis using NVivo for research in construction, real estate, infrastructure and project (CRIP) management', 2nd International Conference on CRIP Management, organized by NICMAR, Pune, November 10-11, 2017. (*Under review process*)
- Nilesh A. Patil and Boeing Laishram, 'Sustainability barriers in PPPs for infrastructure development of India: A triple bottom line perspective'. Conference on Urbanization Challenges in Emerging Economies, organized by The ASCE India Section in collaboration with IIT Delhi and Institution of Engineers (India) at IIT Delhi, December 12 – 14, 2017. (*Under review process*)

Paper Published in Edited Volume

- Nilesh A. Patil and Boeing Laishram, 'Role of lenders in promoting sustainable development in PPP infrastructure projects', *Frontiers of Infrastructure Finance: Issues and Challenges*, Bloomsbury Publication, New Delhi, 190-202, 2015.