

Sustainable infrastructure development challenges through PPP procurement process Indian perspective

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Abstract

Purpose – Infrastructure development through public-private partnership (PPP) route in India has exhibited concerns about not promoting progress toward sustainable development goals, particularly social and environmental perspectives. The purpose of this paper is, therefore, to identify the shortcomings in the Indian PPP procurement process using the key principles of sustainability.

Design/methodology/approach – Qualitative research inquiry through grounded theory approach by using the literature and interview source was used to identify the challenges encountered in sustainable infrastructure development of PPP projects. These challenges were, first, reviewed from the perspectives of key sustainability principles and then discussed with the key stakeholders through focused interviews. Furthermore, micro-interlocutor analysis was carried to get an insight on the extent of consensus amongst the experts regarding these identified shortfalls.

Findings – The key shortfalls identified from the study that adversely affect progress toward sustainable development include incomprehensive environmental impact assessment and social impact assessment studies; lack of stakeholder and local participation; high bidding and transaction cost; high user charges; improper risk allocation; lack of transparency and accountability; goal conflicts between public and private sector; and lack of skill and knowledge about sustainability.

Practical implications – The study findings will help in devising appropriate strategies for enhancing the mechanisms, policies, and governance structure of PPP process in order to overcome these shortfalls and help in accomplishing the goals of sustainability while developing infrastructure even through PPP route.

Originality/value – The paper presents different insights into PPP from sustainability perspective which has not been the focus of the current studies on PPPs. Sustainability assessment of PPP procurement is an area of research which is in a nascent stage.

Keywords Sustainability, Infrastructure development, Sustainable development, Public-private partnerships, Procurement process

Paper type Research paper

Introduction

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 toward 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 (PS) participation using public-private partnerships (PPPs) route. PPPs have enabled the cash strapped governments to build the much needed infrastructure. The governments have laid emphasis on infrastructure development on account of its spillover effects such as poverty alleviation, increased



international competitiveness, and improved productivity, and these spillover 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. However, there exist various issues that adversely affect fulfillment of sustainable development goals when projects are procured through PPP route. For instance, El-Gohary *et al.* (2006) have cautioned that involvement of PS in PPPs, on account its profit-making mindset, raises critical sustainability related 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 and PPPs fail to protect society's interest with respect to these two principles (Clifton and Duffield, 2006). Intra-generational equity, in 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 PS 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). Inter-generational equity, in the 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. 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 contracting functions (Colverson and Perera, 2012).

Indian Government, like other developed and developing countries, has adopted PPPs as one of the preferred route for development of infrastructure projects since the economic liberalization initiated in 1990s. The Indian Governments have been able to attract private investment to the tune of INR 134,205 crore (US\$224 billion; INR 60 D US\$1) through PPP up to 2012 (Planning Commission, 2013). 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 unequal development and social marginalization. The motives of PPPs appear not to be aligned with social welfare maximization objective. The Indian Government, therefore, has expressed the need for focusing on promoting sustainable and inclusive infrastructure development even through PPP route in the current 12th Five Year Plan (2012-2017). This highlights the need to improve the PPP procurement process through incorporation of sustainable development principles in PPP procurement process. The first step toward improvement is to gain insights on why PPPs are not leading to sustainable outcomes so as

to help in identifying the key intervention points. The study in this area assumes immense importance as majority of research on PPPs has been limited to advocacy of PPPs such as PPP model and its applications; risk management; financing and economic issues; legal and procurement issues; and government regulation and guarantees (Zhang *et al.*, 2016). Besides design and logistics of PPPs, few research studies have been undertaken on improving the performance of PPP such as performance measurement of PPP using KPI (Zhou *et al.*, 2013) and sustainable teams' selection for PPPs (Kumaraswamy and Anvuur, 2008). However, very few empirical studies have been undertaken to investigate PPP procurement process from sustainable development perspective. The main focus of this paper, therefore, is to identify the key interventions points for improving the PPP procurement process and, to identify these points, it is necessary to get an understanding of the shortcomings of the current PPP procurement process from sustainable development perspective. The basic aim of this research is, therefore, to conduct an empirical study of the current Indian PPP procurement process to examine the key shortcomings of the process from the perspective of sustainable development.

Sustainability assessment – infrastructure development perspective

Sustainability assessment in the context of infrastructure projects is to assess the proposed project plans, policies, or legislation from the perspective sustainability aspects before the implementation of the project (Devuyt, 1999). In response to the call for promoting sustainable development, several frameworks have also been developed for sustainability assessment of both building and infrastructure projects. For instance, BREEAM (2016), LEED (2016), CEEQUAL (2016), and HK-BEAM (2016) are some of the frameworks developed worldwide for sustainability assessment of buildings. In the similar lines, Indian Government has also developed Green Rating for Integrated Habitat Assessment for sustainability assessment of buildings (MNRE and TERI, 2010). These sustainability assessment frameworks focus on evaluation based on building's resource consumption, waste generation, and overall environment impact. These sustainability assessment methods, however, focus mainly on the environmental protection of buildings only (Curwell *et al.*, 1998; Cole and Larsson, 1999; BRE, 2004). Furthermore, these assessment frameworks have poor coverage of construction and operation-related aspects and focus more on the design aspects of the buildings.

In the context of infrastructure projects, studies have focused predominantly on development of indicators for assessment of sustainability of infrastructure projects. For instance, studies by Lim and Yang (2008), Ugwu and Haupt (2007), and Shen *et al.* (2011) have concentrated on development of context-specific sustainability assessment indicators. Besides studies on development of indicators, few studies have also been undertaken on themes like development of methodology for identification of sustainability assessment indicators (Fernández-Sánchez and Rodríguez-López, 2010) and integration of sustainability in decision making of all the phases of project life cycle (Gilmour *et al.*, 2011). These frameworks are, however, designed to evaluate whether the projects contribute to the goal of sustainable development at one stage of the project procurement process, particularly the project selection stage. Sustainability should be considered early in the procurement process, as later in the cycle there is progressively less scope to add value through improved sustainability outcomes.

In India, public procurement is governed by procurement policies such as General Financial Rules (GFR) (MoF, 2005). The GFR lay down the basic principles of efficiency, economy, transparency, fairness and equitability and promotion of competition in procurement to be followed by central government departments/agencies. Promotion of sustainable procurement in India has been undertaken in a decentralized manner by few public sector entities and government departments by internalizing environmental and energy efficiency criteria in their procurement decisions (TERI, 2013). Consideration of

environmental sustainability in the form of ecolabel and environmental standards in the procurement of products, works and services is, therefore, not a common practice being widely adopted by the public agencies in India. In view of this, the government is in the process of enacting a procurement law in the form of draft Public Procurement Bill 2012 which is expected to provide legitimacy to procurers' decisions of integrating environmental concerns in public procurement (MoF, 2012). In order to complement this initiative, the government also needs to develop a well-defined framework highlighting the principles on integrating the dimensions of sustainable development in public procurement so that concept of sustainable procurement is operationalizing at the organization level.

On the other hand, few of the developed countries have initiated integration of sustainability concept in public procurement in the form of sustainability-specific procurement policy, national procurement law, national action plans, and regulations. For example, the "Law of Promoting Green Purchasing" makes it mandatory for government institutions in Japan to implement sustainable procurement (MoE, 2015). In New Zealand, "Government Framework of Sustainable Procurement" provides guidelines for federal, state, and local governments for public procurement (MoED, 2010). In the similar lines, the UK Government mandates use of sustainable procurement standards for public procurement. A flexible framework to support progress toward sustainable development has been formulated as part of the sustainable procurement action plan (DEFRA, 2010). The Department of Housing and Public Works has also developed guidelines for sustainable procurement of public works to be executed in the State of Queensland (DHPW, 2014). These procurement guidelines define sustainability in the context of public procurement as a process whereby organizations (public or private) procure goods and services in a manner that generates benefits to the organization, society, and the economy while ensuring that the environmental impact is minimal (UNEP, 2013). These guidelines define sustainability in public procurement as inclusion of environmental, economic, and social criteria in the procurement of goods, services, and works by public sector organizations and include sustainability indicators to measure progress toward fulfillment of social, economic and environmental dimensions of sustainable development, adopting a triple bottom-line approach.

The triple bottom line approach is effectively a "bottom-up" approach wherein indicators are generated by assuming that simultaneous achievement of environmental, social, and economic goals defines the state of sustainability. The triple bottom approach, though, is a commonly adopted approach but it has been argued that 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 principles-based approach (also known as the top-down 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. In order to promote the use of this approach, several efforts have been made to develop sets of sustainability principles. George (2001) and Sadler (1999) 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 established a set of eight generic sustainability principles which can be used to develop sustainability criteria for assessment of plans, programs, and projects. These eight principles of sustainability formulated by Gibson (2006) have been widely used in formulation of core criteria for sustainability assessment for urban development proposals (Morrison-Saunders and Hodgson, 2009); water governance regimes (Wiek and Larson, 2012) and critical river basin infrastructures (Shah and Gibson, 2013). The Gibson's principles are: socio-ecological

system integrity; livelihood sufficiency and opportunity; intra-generational and inter-generational equity; resource maintenance and efficiency; socio-ecological civility and democratic governance; precaution and adaptation; and immediate and long-term integration. These eight principles of sustainability have, thus, been used in the current study to measure the extent to which the current Indian PPP procurement process promotes the goals of sustainable development.

Internationally, the development of extensive sustainable procurement guidelines could be still viewed as nascent, except for few countries such as New Zealand, Australia, and the UK, and sustainability assessment studies on the extent to which the current PPP procurement process promotes sustainable development is an area which has not been studied in detail. The current study is, thus, expected to help the governments in formulating the framework for promoting sustainability in procurement of PPP infrastructure projects.

PPP procurement process for infrastructure development in India

The Government of India has streamlined the procurement process of PPP projects along with the formulation of model concession agreements (MCAs) and standardized bidding documents such as model request for qualification (RFQ) and model request for proposal (RFP) for infrastructure projects under its jurisdiction (Planning Commission, 2011). The state governments 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 PPP framework established by the Union Government. The study, therefore, has focused on the procurement process set up by Planning Commission to examine the extent to which the key deliverables of the process help in promoting sustainable development goals. The Indian Government has divided the life cycle of PPP projects into four phases: project identification, project development, project procurement, and project management (DEA, 2011). In the identification phase, the need for a particular infrastructure facility is first identified through strategic planning. Pre-feasibility analyses for the identified projects are carried out along with the environmental impact assessment (EIA) and social impact assessment (SIA). The identified projects are then assessed for suitability of developing the project through various PPP models using value for money (VfM) analysis. The potential PPP model that was considered suitable in the previous phase is studied in detail in the development phase through a full feasibility study and PPP due diligence to investigate 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 (optimum combination of whole life cycle (WLC) costs, risks, completion time and quality). In the procurement stage, a procurement committee is set up to lead procurement and evaluation; reviewing the project information and making necessary updates and appointment of a monitor to ensure quality and process oversight. The project is, then, awarded to the private entity which satisfies the bid evaluation criteria, which is already specified in the development phase through a RFQ, and through the final draft of bid documents which includes, RFP and concession agreement (CA). Finally, in the last phase, the project is managed and monitored through institutional setup and independent monitor to ensure successful implementation and satisfactory performance over the life of the PPP project.

Research method

The main objective of this study is to identify the key shortcomings in Indian PPP procurement process from the perspective of sustainable development. The main aim of the study is, therefore, to gather evidence to answer the research question:

RQ1. What are the key shortcomings of Indian PPP procurement process preventing progress toward fulfillment of sustainable development goals?

Fellows and Liu (2008) suggested that when research question and objective are descriptive in nature, then qualitative research is the preferred research method. The study, therefore, has adopted a qualitative research approach for the research inquiry. Further, Creswell (2007) mentioned that 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 introduced by Glaser and Strauss (1967) defined it as a theory that emerged from the data with defining categories and interrelationship of variables. 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). As the main aim of the current study is to identify the key shortfalls in PPP process from the perspective of sustainability goals, therefore, the study perceived grounded theory approach to be the preferred approach for the research inquiry as the main of the study is to develop a theory of shortfalls in PPP procurement process through categorization and definition of interrelationships with the principles of sustainability.

The grounded theory approach suggested by Strauss and Corbin (1998) and Birks and Mills (2015) has guided the design of the present research inquiry. Strauss and Corbin (1998) described three major components of grounded theory methodology as collection of data (through the literature and interview), interpreting and organizing data (through coding procedure), and theorizing through generation of reports/ discussion through memo writing. The present study had used the same three components for identifying shortfalls in PPP process from the perspective of sustainability principles to develop the grounded theory:

- Data collection – the grounded theory approach enables inductive development of theory from a corpus of data. Strauss and Corbin (1998) suggested that grounded theory is more appropriate for developing theory from multiple sources of data. The authors further mentioned that the grounded theory approach emphasizes on the meaning of experiences for a number of individuals in generating the theory. The study, therefore, used multiple sources of evidences from both secondary and primary sources of data – literature review and focused interviews, respectively. The units of analysis are articles and respondents for this study. The main purpose of using two data sources has been to first identify the preliminary shortfalls in PPP procurement process and corroborate these finding with the interview findings to identify the final set of shortfalls from the perspective of sustainable infrastructure development goal. This approach to a collection of data using multiple sources ensured the internal validity through triangulation of data.
- Data analysis (interpreting and organizing data) – the qualitative data from both the sources were analyzed using the three steps of qualitative data analysis (QDA) established by Miles *et al.* (2013). The three steps are data condensation through coding, drawing of the conclusions, and confirmation of the findings. NVivo10 has been used as the Qualitative Data Analysis Software (CAQDAS) tool to analyze the qualitative data from the two sources in the two initial stages of data analysis. NVivo10 has the capability to store, organize, and analyze the qualitative data from the literature as well as from the interviews (O'Neill, 2013). Also, Hutchison *et al.* (2010) suggested that CAQDAS has the potential to turn qualitative research into a rigid automated process that neglects the role of human interpretation and reflection. In the first step of QDA, the coding procedure introduced by Strauss and Corbin (1998) has been carried out using open and axial coding with free and tree node in NVivo10. Then, drawing of conclusions from the coded data was conducted using qualitative techniques such as classical content analysis (CCA) and constant comparison analysis. In the last step of QDA, confirmation of the findings was carried out using micro-interlocutor analysis (MIA) developed by Leech and Onwuegbuzie (2008).

- Developing the theory (theorizing/ discussion) – after the above two steps of QDA, the findings from the literature review and focused interviews were integrated through the process of memo writing in NVivo10. 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 shortfall from the perspective of affected sustainability principles in developing the theory of sustainability issues in PPP procurement process for infrastructure development.

Data collection and analysis

In this study, the three components of the methodology for development of grounded theory have been conducted simultaneously using the two data sources to develop the theory of shortfalls in PPPs. Further discussion on the details of data collection and analysis using the literature review and focused interview is the focus of this section.

Literature review: secondary data source

A critical review of secondary data sources such as research article, reports, thesis, and online data on PPP practices for infrastructure development was conducted to identify the preliminary shortfalls in PPP procurement process. The articles were analyzed through a keyword search using 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: publications that had focused on international overview of the PPP process, methodology, and case studies; and accessibility of publications to a wide international audience. The reason for the selection of these two criteria is to avoid those articles which have limited region-specific accessibility. A total of 48 key documents were reviewed from secondary data sources to identify the shortfalls in PPPs. The classification of the articles includes 22 journal articles, 16 research reports, eight online sources, and two theses. All the 48 documents were, then, uploaded in NVivo10 for further analysis. The coding procedure introduced by Strauss and Corbin (1998) had been conducted in this study using open and axial coding for identification of the preliminary shortfalls. The identified preliminary shortfalls from each article were coded as free node through open coding in NVivo10. Then, the CCA introduced by Leech and Onwuegbuzie (2008) was used to analyze the number of articles coded to a specific shortfall. The results of the CCA are summarized in column 3 of Table I. It could be observed from the analysis that a total of ten preliminary shortfalls have been identified and the shortfall “high bidding and transaction cost to the private sector” coded highest number of articles (i.e. 24 times) and shortfall “future unforeseen issues not accounted in EIA and SIA” coded the lowest number of articles (i.e. six times).

Furthermore, the identified preliminary shortfalls were reviewed from the perspective of principles for sustainable development. The main aim of this step is to identify the sustainability principles that had not been fulfilled relating to each of the shortfall. Constant comparison analysis introduced by Glaser and Strauss (1967) was used to identify the underlying themes (i.e. failed sustainability principles). In this step, the themes from coded data (free nodes) were identified to generate tree nodes or axial codes through constant comparison analysis, and the sustainability principles relating to the shortfalls were then used as the themes for labeling purpose. The result of constant comparison analysis is shown in column 2 of Table I highlighting the sustainability principles which have been adversely affected by the identified shortfalls using the symbol “X”. It could be observed that each preliminary shortfall fails to accomplish at least one of the principles of sustainability.

Shortfalls in PPP procurement process (open coding: free node)	Failed sustainability principles (constant comparison analysis)							Number of sources coded – units of analysis (classical content analysis)		Overall consensus in respondents (micro-interlocutor analysis)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	Article	Respondent	
Future unforeseen issues not accounted in EIA and SIA	×						×	06	24	+
Risk allocation not accounting for future unpredicted impacts	×						×	17	24	+
Higher user charges for infrastructure services			×	×				13	24	+
High bidding and transaction cost to private sector			×	×				24	23	+
Lack of stakeholders and local public participation	×					×		11	24	+
Goal conflicts between public and private sector	×					×		07	23	+
Lack of transparency and accountability during bidding	×					×		18	23	+
Inadequate whole life cycle costing of VfM analysis		×					×	16	23	+
Lack of skill and knowledge of sustainability concepts		×					×	17	23	+
Incomprehensive bid evaluation criteria	×	×						18	22	+

Notes: Acronyms for principles: (1) socio-ecological system integrity; (2) resource maintenance and efficiency; (3) livelihood sufficiency and opportunity; (4) intra-generational equity; (5) inter-generational equity; (6) socio-ecological civility and democratic governance; (7) precautionary and adaptation, and degree to which shortfall was possible to hamper the sustainability of PPP procurement process. + indicates agreement; ++ indicates strongly agreed; – indicates disagreement; – – indicates strongly disagreed; + – indicate neutral response; NR, did not indicate agreement or dissent, i.e. non-response

Table I.
Results of qualitative
analysis for
shortfalls in PPP
procurement process

Focused interview: primary data source

The preliminary shortfalls that have emerged from the review of literature had been subjected to further analysis through focused interviews in order to develop the grounded theory. In the present study, focused interviews were conducted in three stages, namely selection of respondents, interview protocol, and analysis of interview transcriptions, and these stages are discussed below.

Selection of respondents. The targeted respondents 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 PSs. The respondents/experts were selected based on the criteria introduced by Hallowell and Gambatese (2010). The criteria include educational qualification, position in the organizational hierarchy of the firm, and number of years of experience relating to PPP procurement process for infrastructure projects in India. The main reason for preferring these selection criteria was to avoid seeking insights from respondents that have less than five years of experience in PPPs, screen out non-graduate respondents and those working at lower management level. Initially, preliminary lists of 54 experts were identified for the interviews through web-based search, but only 33 experts had fulfilled the selection criteria. The preliminary list of experts had been drawn up to ensure equal representation of all the four stakeholders in the study. Then, all the respondents were contacted either by mail or telephone requesting them to participate in the study. After the preliminary interaction with the 33 experts, nine experts declined to participate in the study citing personal and official reasons. The interview template was then shared with the remaining 24 interview respondents.

Interview protocol. The semi-structured interview protocol had been designed to determine respondent's understandings about the shortfalls in PPP process. Interview template comprised of two sections: section I focuses on seeking information about qualification and experience of the respondents in PPP projects development; section II comprises of open-ended questions aimed at gathering respondents' opinion and suggestions on preliminary shortfalls relating to the sustainability principles. In order to assess comprehensiveness of draft interview template, a pilot study was conducted with six experts involved in the development of PPP projects in Guwahati region during September 2014. The pilot study was conducted to check the comprehensiveness of the interview template. Then, the final face-to-face interviews were conducted with the final 24 respondents. The interviews with 24 respondents were conducted during the period November 2014 to January 2015. The distribution of experts amongst the four stakeholders group and fulfillment of three selection criteria have been summarized in Figure 1. Sample size in qualitative research projects is determined using the concept of saturation (Miles *et al.*, 2013). Saturation occurs when new interviews do not provide additional data over previously conducted interviews. Davis *et al.* (2013) mentioned that the 90 percent of findings can be recognized with as little as 12 interviews. In this study, saturation was observed around 20 interviews and further four more interviews were conducted, resulting in 24 interviews. The data from the 24 interviews were transcribed in MS Word files and handwritten notes.

Analysis of interview transcriptions. The 24 transcripts from the interviews were subjected to further QDA using NVivo10. The three steps of QDA introduced by Miles *et al.* (2013) were used for this analysis. The steps are data condensation through coding, drawing of the conclusions, and confirming the findings. In the first step of QDA, suggestions from the respondents on each shortfall were coded as a free node with open coding. Leech and Onwuegbuzie (2008) suggested that the data generated through the interview or talk could be

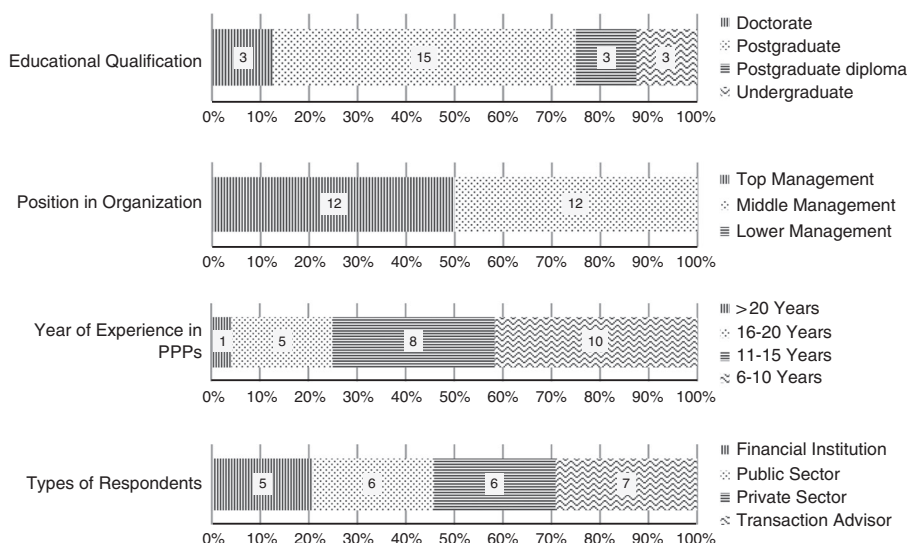


Figure 1.
Demographic
information of
respondents

better analyzed for drawing the conclusions using qualitative techniques such as CCA, constant comparison analysis, and memo writing. In the second step of QDA, these three qualitative techniques have been used for drawing the conclusions from interview data. CCA was conducted to count the number of respondents coded against each shortfall. It has been observed from the CCA that almost all the respondents have coded the shortfalls. The shortfall “incomprehensive bid evaluation criterion” was the one which was coded lowest, wherein only 22 respondents had coded this shortfall. The result of CCA is shown in column 4 of Table I. Then, a constant comparison analysis was conducted to identify the sustainability principles relating to each shortfall through axial coding/tree node. The result of constant comparison analysis is shown in column 2 of Table I. It could be observed from the constant comparison analysis that all respondents have shown their agreement on the same categorization of the preliminary shortfalls with respect to the principle of sustainability, which was already conceptualized through the literature review. In addition, Strauss and Corbin (1998) have suggested that the writing memos is the best option to explore the finding through discussion. As per the suggestion given by Hutchison *et al.* (2010), the conceptual type of memo had been used to explore the theory of sustainability issue relating to each shortfall by using findings from both sources. In this study, the findings from secondary evidence (literature review) have been corroborated with the primary evidences (interview) through conceptual memo writing in NVivo10. The memos for each shortfall with the respective dimensions of sustainability that have been affected by the shortfall have been prepared to develop the grounded theory. The discussion of grounded theory for each shortfall is discussed in the next section.

In the last step of QDA, the confirmation of the findings was carried out using the technique of MIA developed by Leech and Onwuegbuzie (2008). This analysis has been used to confirm the findings by displaying the respondents’ consensus for each shortfall in the form of a matrix using a five-point rating scale. The level 1, 2, 3, 4, and 5 of the five-point scale represents “strongly disagree,” “disagree,” “neutral,” “agree,” and “strongly agreed.” These levels are presented in the last column of Table I by symbols “++”, “+”, “+ -”, “-”, and “-”, respectively. The scores representing the extent of consensus amongst the respondents’ viewpoints on each shortfall were then represented in the form of a mean value

of all respondents' score on the five-point scale. The respondents have shown their agreement on the occurrence of all the shortfalls except one shortfall (lack of transparency and accountability during bidding) which has been rated as neutral.

Discussion on findings

The grounded theory on the key ten shortfalls had emerged from the literature review which have been corroborated with the interview findings through qualitative analysis. These key shortfalls are listed in the first column of Table I. These shortfalls are the key challenges in the Indian PPP procurement process hampering progress toward sustainability. The discussion of this grounded theory on these shortcomings from the perspective of sustainability principles are presented below.

Future unforeseen issues not accounted in EIA and SIA

In the current procurement process of India, EIA and SIA are part of the feasibility study to minimize the impact of the project on the surrounding environment and community (DEA, 2011). However, there is a strong belief amongst the government experts that the current EIA fails to deliver this objective and EIA alone does not seem to promote delivery of sustainable outcomes. EIA focuses 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 (Arts and Faith-Ell, 2012). However, exclusion of assessment of the projects in terms of human benefits in the current EIA will adversely affect the "socio-ecological system integrity" principle of sustainability. In the current approach, many decisions that influence project design and environmental performance are made after the EIA. EIA has also failed to reflect the long-term environmental and social impact of infrastructure development. A proper assessment future unforeseen social and environmental issue has also not been taken into account in the current EIA and SIA. Failure to account for future unforeseen social and environmental issues as part of the assessment in the current EIA and SIA will adversely affect the "precautionary and adoption" principle of sustainability. In order to overcome these limitations, two of the experts from the public sector have stressed on the need for the realistic and in-depth environment and SIA during feasibility study:

"Current EIA has become more of a routine study with the focus on compliance only. The study needs to be in-depth, as also advice on design and operations needs to be more elaborate." "Government needs to make a realistic assessment of EIA and SIA impact prior to the feasibility study and preferably it should be clubbed with a pre-feasibility study as a part of the procurement process."

Similarly, another respondent from the PS highlighted the need for standardization of EIA and SIA so that it will help in delivering sustainable outcomes:

As far as projects in India are concerned, EIA and SIA activities are not standardized. Right now they are used in an ad-hoc manner. There are no fixed norms. EIA and SIA are carried out on a case to case basis. Financial/viability norms are paramount in decision making rather than EIA and SIA. To be able to optimize the project for environmental, social and community benefits, our financial/viability norms will have to be flexible. Right now the economic condition of the public sector is not sound and they may not be able to support these activities. So even if conceptually EIA and SIA activities can optimize environmental, social and community benefits, not much progress is seen on this front.

Risk allocation not accounting for future unpredicted impacts

The government has standardized the CA to address the typical issues of limited recourse financing in order to enable private investors to secure reasonable return at manageable levels of risk (Planning Commission, 2009). Both the private and public sectors need to have

a better understanding of these risks in order to achieve an equitable risk allocation and enable the project to generate better outcomes. However, the majority of the public and PS experts have mentioned that the current risk allocation mechanism has not considered the risks of future unforeseen impacts on the project.

The government has also not set up guidelines to fix the extent to which excessive risk can be shifted to the PS. A common mistake in risk allocation of PPP projects is transferring the demand risk to PS even when the PS has no control over the demand factors. 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 (Colverson and Perera, 2012). The inflexibility in current MCA regarding future unforeseen events or circumstances is a concern for the private parties. The practice of not including provision for risk allocation of future unforeseen impacts will fail to promote the objectives of “socio-ecological system integrity” and “precautionary and adaptation” principles of sustainability. In order to enable PPPs to mitigate unforeseen future impacts, two of the experts from the public and PS have suggested that there will be a need for a flexible MCA:

The current model concession agreement (MCA) is a more rigid contract and it will be very difficult for the government to structure a contract that takes into account future unforeseen events or circumstances wherein the contractual responsibilities can change and adapt as context changes.

The project authority must keep in mind that the MCA cannot be simply adopted. Every single project poses a different level of challenge. It would require an adjustment in MCA on a project-to-project and sector-to-sector basis. Therefore, there has to be a distinct strategy for each project on effective risk allocation. Hence, flexible MCA is required without diluting the overall objective of the project.

Higher user charges for infrastructure services

Determination of user charges for PPP projects should 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 explicit subsidies, and affordability (DEA, 2011). The current regulatory mechanism has natural monopolistic characteristics and this needs to be regulated to ensure that the interests of users and service providers are protected taking into consideration the affordability of the users and certainty of pricing and revenue stream to a private party. One of the most common complaints by the general public against PPP projects has been the high tariff charged for the infrastructure services (Gupta, 2011). The majority of the experts representing GS and TAs have also indicated that user charges for infrastructure services are high and this high charge will make the service unaffordable and prevent access to infrastructure services to the poorer section of the society. These issues of un-affordability and inaccessibility of infrastructure services to the poorer section of the society adversely affect the “livelihood sufficiency and opportunity” and “intra-generational equity” principles of sustainability, respectively. One of the government experts indicated the need for a compensation mechanism for the section of the society inaccessible to infrastructure services:

I agree that certain sections of the society may not be able to afford these services. However, it is up to the government to provide a mechanism for compensating them. The best the government should do is to devise mechanism like AADHAAR (a unique identification number). However, such mechanism must be introduced and widely publicized at project conceptual stage and before bidding.

Similarly, TAs who strongly agreed that user charges are high for certain section of the society have suggested adoption of annuity model and viability gap funding (VGF) mechanism to increase stakeholder acceptability of PPP projects:

Adopt shadow tolling and increase the use of annuity payment mechanism to reduce a high tariff charge. Also, enhance current government payment support system like viability gap funding (VGF), which is currently limited to 40% of total project cost.

High bidding and transaction cost to PS

Indian Government has established a well-defined bidding process for PPP infrastructure projects. However, the plethora of local bodies in India is usually involved in implementation of a project and private agencies often need to procure permits and approvals from several agencies. This considerably increases the transaction cost of a project and often necessitates exchange of bribe to move forward (Mahalingam, 2010). It has been indicated that transaction cost relating to bidding for PPP projects is six times higher than the traditional procurement arrangement (Curnow *et al.*, 2005). In such circumstances, it is very unlikely for smaller contractors to be able to participate in PPP infrastructure projects. On account of high transaction costs, the competition is limited to large financially sound firms while the small local contractors are not able to participate in the competition. Thus, high transaction and bidding cost fail to provide equal opportunities to the small and local contractor and this view has been agreed by four out of six experts from the PS. From sustainability perspective, these issues have an adverse effects on the objectives of “livelihood sufficiency and opportunity” and “intra-generational equity” principles of sustainability. One of the experts from the PS has given a suggestion for altering the bidding process to reduce transaction cost:

By bringing in standardized norms and transparency we can reduce costs. Currently, our practice is to make the project viable by tweaking norms or by manipulating data relating to demand and costs. By avoiding this practice, lengthy negotiations can be avoided and some cost will definitely be saved.

In order to reduce the transaction cost, one of the experts has also suggested on using a different model:

Transaction cost is added to whole life-cycle cost (WLC) of the project and its spread over entire project’s concession period. Hence, attempts should be made to reduce the transaction cost. Use success fee model for the project to minimize transaction cost to government and project itself.

Lack of stakeholders and local public participation

PPP projects have often encountered challenges of political and social nature such as opposition to land acquisition, activism for heritage site protection, and environmental pollution (Cheung, 2009). These challenges lead to public opposition, over-blown costs and delays to the projects. All the respondents have also 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. Few of the high profile examples of public unrest leading to delay of PPP projects in India cited by the respondents include Timarpur-Okhla Integrated SWM project (public opposition on environmental ground), Latur Water Supply Project (public opposition on “right to water sentiment), Coimbatore Bypass Toll Road (local public refusal to pay tolls), and Mumbai Metro and Delhi-Gurgaon Expressway (opposition by local public in land acquisition). Opposition by the local public on social and environmental issues could adversely affect “socio-ecological system integrity” principle of sustainability, whereas opposition by the stakeholders to change in government policies could adversely affect socio-ecological civility and democratic governance” principle of sustainability. In order to improve stakeholders’ participation, the respondents have suggested various mechanisms. For example, one of the experts has expressed the need for the greater role of the political system:

In addition to stakeholders, it is the duty of political leadership to create awareness about advantages of PPP to the public. It is seen that many times political parties oppose the projects for populism even though they are aware that these projects are necessary as public sector does not have the resources to complete the project by itself.

Similarly, another expert has expressed the need to introduce new innovative approach:

Therefore a proper information system is to be established to help people to judge between right and wrong, and take on issues which are really harmful to them.” “Transaction advisor’s scope of work should include stakeholders” consultation at the planning stage of a project.

Goal conflicts between public and PS

The goals of the PS fundamentally oppose those of the public sector. Public sectors were used to dealing with the PS as contractors and, therefore, it was not very easy for them to shift to a mindset where the PS would also own and operate services traditionally run by governments and line agencies (Mahalingam, 2010). The goals conflict between PS and government is an important issue that should be taken care of by the government. Three out of four government experts who had participated in the interview have strongly agreed on the prevalence of goal conflicts between the public and PS and similar views were also expressed by the PS. Thus, one of the experts from the GS had mentioned that:

The objective of PPP may also be to seek the technical expertise of private player and also to tap the modern technology and efficiency available in the market. However, the goal conflict between private and public sector would be due to lack of project preparation and unbalanced risks allocation without maximizing the benefit to both the partners.

There are instances of failure of PPP projects in India due to conflicting goals between public and PS. 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 CA signed by the previous government on the pretext of a damaged approach road without compensating the concessionaire (Mahalingam, 2010; Gupta, 2011). 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 (PS) and Government of Maharashtra, PWD on the issue of widening the road (Tiwari and Ashish, 2013). The issue of goal conflict between public and PS on social and environmental issues could adversely affect the “socio-ecological system integrity” principle of sustainability. In order to avoid such goal conflicts, few of the suggestions given by the experts include:

Goals of public authority should be spelt out very clearly at project planning stage so that same can be adequately addressed by Transaction Advisor (TA) in his feasibility report and procurement process.

A proper monitoring by the competent authority should be done with the help of NGOs with good reputation.

Lack of transparency and accountability during bidding

The government has consciously moved toward competitive bidding and maintenance of transparency in the award of infrastructure projects through PPP route. In spite of this, PS funding components still fail to appear on public spending records. The PS data on profits, costs, or lessons learned are considered issues of commercial confidentiality and this information is not easily accessible highlighting the lack of transparency and accountability (Colverson and Perera, 2012). The experts representing PS and TAs have shared the same view about the lack of transparency and accountability in the Indian PPP bidding process. Examples of past PPP projects in India such as “Dabhol Power” project and “Pune Water Supply and Sewerage” project highlight that these projects got canceled due to lack of transparency and competition in the bidding process. The principle of the “socio-ecological system integrity, and civility and democratic governance” will be adversely affected in case of failure to ensure transparency and accountability during bidding stage. However, most of the experts from the public sector, and FIs do not think the system to be not transparent.

In order to improve the transparency and accountability during bidding, some of the experts have offered the following suggestions:

However, this could be controlled by making availability of data online to maintain the transparency. And, to improve transparency, information on the profit and cost should be made accessible.

Government should appoint a body of independent experts to examine the bidding process.

Inadequate WLC costing in VfM analysis

VfM is an optimum combination of the WLC, risks, completion time and quality in order to meet public requirements. The theory of WLC used in VfM assessment is based on the fact that operating costs are given due weightage in a trade-off against capital cost in the “unitary charge” paid by the client. This should drive efficiencies in resource utilization of all kinds, including lower energy and water use, more durable and recyclable materials, and waste minimization. This should also mean that higher capital investment could be justified in order to gain these operating efficiencies. However, the potential of WLC is undermined in practice because any savings in operating costs from adopting a sustainable design will, thus, have to be proportionately higher to justify the increased capital costs, and associated risks, which the contractor will try to keep as low as possible (Hill and Collins, 2004). VfM estimation tool prepared by DEA requires improvement as it is still a highly subjective and promote misleading practice. Inadequacy about the estimation for WLC in VfM assessment is one of the shortfalls that have also been strongly expressed by all the experts representing the six stakeholders. Furthermore, experts contended that VfM estimation does not take into consideration environmental and social externalities. Estimation of WLC without considering the evaluation of cost and benefits in externalities will adversely affect the “resource maintenance and efficiency” principle of sustainability. One of the respondents discussed this issue as follows:

There is a need for realistic WLC estimation of VfM analysis to achieve sustainability goals. For this, environmental and social parameters must be considered for VfM analyses, and the process should be simple and fast to implement.

Furthermore, optimal risk evaluation for VfM analysis is still missing in VfM estimation tool prepared by DEA in India (Gupta, 2011). VfM analysis is, thus, based on a false premise that the optimal risk allocation framework can be framed and VfM can be assessed based on such framework. The practice of adopting an optimal risk evaluation without considering the future unforeseen risk in VfM analysis adversely affects the sustainability goals from the perspective of “precautionary and adaptation” principle. One of the experts expressed the need for improvement of risk allocation model for VfM estimation:

Public sector should improve risk model in public sector comparator for VfM analysis. There is a need to include provision for evaluation of future climate change parameters, and include long-term social and environmental impact on the project in risk model of VfM estimation.

Lack of skill and knowledge about sustainability concepts

PPP projects require multidisciplinary and highly specialized expertise on account of complex nature of the business transaction. The typical actors/experts engaged by the government include TAs, financial experts, legal experts, EIA consultants, and technical consultants. Public officials in India are not well trained in areas such as financial and legal matters and they lack awareness about sustainability and green concepts relating to infrastructure development (Hill and Collins, 2004). The experts representing the five stakeholders have shown their agreement about the lack of sustainability knowledge by the experts involved in PPP projects. Knowledge about sustainability is essential for both public and PS for procurement preparation and

evaluation otherwise, this could result in several distorting effects in public resources allocation and one of the experts has shared his experience:

Recently, larger infrastructure projects are now prepared by divisional officers (higher authorities), who do not have specific knowledge in this area (sustainability concepts). This leads to serious shortcomings and huge losses to society and to the government.” “Therefore, substantial steps will have to be taken by the center and various state governments to enhance the capacity of the existing manpower with respect to sustainability aspects.

Incomprehensive bid evaluation criteria

Bid proposals submitted by private players in case of PPP projects are normally evaluated with respect to various aspects relating to technical feasibility and financial sustainability and the bid is awarded to the private entity with the maximum score on these aspects (Planning Commission, 2009). The private players, therefore, focus only on maximizing returns and recover the investment by making necessary crucial changes in the project as the bid evaluation criteria are in financial terms. The current bid evaluation criteria for PPP program in India also focus on financial sustainability only when selecting bidder and awarding the project (DEA, 2011). This practice of giving more importance to financial sustainability only will fail to promote the sustainability goals pretending to “resource maintenance and efficiency” principle of sustainability. The majority of the TAs, who play a key role in designing the bidding process, agreed with the fact that the criteria used for bid evaluation in Indian PPP projects are inadequate and evaluation should also encompass social and environmental dimensions. Similar viewpoints have also been expressed by the majority of the experts representing the PS.

PS expertise could be put to better use in meeting not only the minimum standards for clearance but in creating a competition for social and environmentally sustainable solutions for the continuous improvement whereby the private player can be incentivized as appropriate. Hence, the procurement process of PPP project should embed environmental and social safeguards in their tender evaluation, supplier selection, and monitoring and contract functions. Similar opinions have also been expressed by some of the experts and some of the observations are as follows:

“It should be quality based selection, giving proportionate weightage to parameters like promoting green procurement, experience in social and environmental mitigation.” “In fact only those concessionaire should be considered for pre-qualification, who have done works on environmental control and have an environmental unit in their establishment having qualified staff on permanent roll.”

“Embedding the environmental and social safeguards is desirable. However, quantifying these safeguards must be precise and there should be clarity on how they will be implemented and who will monitor/certify them. Project Implementation Agencies (Public Sector Officials/ Independent Engineers/Consulting Engineers) are not well equipped to monitor these aspects.” Moreover, “if we intend to create a separate Agency/Organization to monitor environmental and social safeguards/dimensions a clear rules/laws about their qualification/experience/fees etc. must be made before bidding.”

Recommendations

The findings from the study indicate the need for devising strategies to improve the PPP procurement process in the following key areas so that it can ensure fulfillment of sustainable infrastructure development goals.

Advancement in mechanisms

The mechanisms like EIA estimation, VfM analysis, and bid evaluation criteria would need to be modified to promote sustainable development goals. The existing EIA estimation

could be improved through the inclusion of additional assessment for climate change considerations (i.e. GHG emission from project and climate change impact on the project). The risk model of VfM estimation should be enhanced with the inclusion of qualitative parameters for long-term social and environmental impacts of the project on the surrounding environment. The bid evaluation mechanism could be enhanced through the inclusion of additional bidding criteria to assess the extent to which the projects promote utilization of energy efficient systems that minimizes pollution and are also cost effective. PPP unit should establish national training programs with the help of specialized sustainability experts to guide the government officials on sustainability deliberation in PPP procurement. The inclusion of these various strategies in EIA, VfM analysis, training program, and bid evaluation mechanisms would serve to be an effective tool for achieving sustainability through fulfillment of the perquisites of “resource maintenance and efficiency,” “socio-economic system integrity,” and “precautionary and adoption” principles of sustainability.

Revision in government’s policies and support systems

The governments should also attempt to revise the policies on risk management, transaction and bidding process, and support systems for user charges. For effective risk management, current standard CA should have flexible to address future unforeseen issues relating to climate change and any other disasters. Transaction and bidding process could be enhanced by giving more flexibility to the PS in preparation of the master plan for the project so that it promotes innovative bid and minimize the transaction and bidding cost. Regarding the government support systems for minimizing user charges for services, the federal government should enhance current VGF up to 50 percent of total cost of the project or otherwise promote hybrid PPP annuity model for the selected projects. These revisions in government policies and support systems would become an effective tool to balance the risk allocation and minimize the bidding and transaction cost and as well users charges. These changes in government’s policies and support systems will help PPP in promoting sustainability in terms of the principles of “livelihood sufficiency and opportunity,” “intra-generational equity,” “socio-economic system integrity,” and “precautionary and adoption,”

Enhancement in governance structure

The governance system of PPP procurement process needs to be enhanced to promote stakeholders’ participation, promote sustainability skill and knowledge, and accountability of public sector. Stakeholder’s participation could be enhanced through introducing of special purpose company, which would be jointly owned by users, private developers, and local government. The skill and knowledge about integrating sustainability in PPP projects could be enhanced through appointment of “sustainability advisor.” The accountability of bidding process could be enhanced through the appointment of an auditor as a third party independent expert, which provides a level of assurance to sponsors and bidders on the fair procurement process. The enhancement in understanding about sustainability, accountability and transparency and public participation through restructuring of governance system will help the PPP procurement process to promote “socio-ecological system integrity” and “socio-ecological civility and democratic governance” principles of sustainability.

Conclusions

PPPs have been adopted as one of the innovative routes for development of infrastructure projects in India. The decision to opt for infrastructure development is motivated by efficiency gains and additional private capital from the PS. But, PPP projects have failed to deliver in

promoting the goals of sustainable development and, as a result, there are various criticisms of unsatisfactory performance of PPP projects on the sustainable development front. The incomprehensive mechanisms like EIA and SIA, and risk allocation for future unforeseen issues on the project have an adverse impact on the promotion of “socio-ecological system integrity” and “precautionary and adaptation” principles of sustainability. Other issues like higher user charges for infrastructure services to users and high bidding and transaction cost to the PS have hindered progress toward promotion of sustainability goals of “livelihood sufficiency and opportunity” and “intra-generational equity.” The “socio-ecological system integrity” and “socio-ecological civility and democratic governance” goals of sustainability are still vulnerable due to lack of proper governance structures like holistic stakeholder’s participation, and ensuring transparency and accountability during bidding. Further, incomprehensive WLC estimation for VfM analysis and lack of training on sustainability knowledge will have an adverse impact on the promotion of “resource maintenance and efficiency” and “precautionary and adaptation” principles of sustainability. Again, the “socio-ecological system integrity” and “resource maintenance and efficiency” principles of sustainability are still vulnerable due to lack of appropriate bid evaluation criteria to measure progress toward achievement of sustainable development goals. The shortcomings identified in this study have focused on PPP procurement practices in the context of infrastructure development in India. The existence of these shortcomings in another contextual environment of other countries using PPP as the preferred mode of infrastructure development needs to be studied.

The presented theory on sustainability issues/shortfalls in PPPs could be an effective tool for policy makers and TAs of PPPs in restructuring the PPP procurement process so as to accomplish the objectives of sustainable development. The framework would act as a guideline on how to integrate the principles of sustainability in procurement process so as to overcome the various shortfalls that had not been mitigated in the current PPP process. The key strategies that could be implemented by policy makers to improve PPP procurement process from sustainability aspect may be related to advancement in mechanisms used for evaluating PPP projects (such as EIA estimation, VfM analysis, sustainability training, and bid evaluation criteria); revision in government’s policies relating to risk allocation framework, transaction and bidding process and support systems for user charges; and enhancement of governance system to promote stakeholders’ participation, promote accountability during the bidding, and upgrading the knowledge of sustainability of public sector. However, the feasibility of incorporating these strategies should be investigated to address the key research question:

RQ2. How to integrate these strategies in current PPP procurement process so that the process leads to sustainable infrastructure development in the context of conflicting motives of the PS and public entities.

Such an exercise will improve the usefulness of the findings and could be useful for policy makers and TAs of PPPs in formulating new strategies to enhance the sustainability of PPP procurement process. Further, the study has elaborated the principle-based (top-down) approach for sustainability assessment. This approach could be treated as an alternative tool for researchers to assess the sustainability in a different context using the key principles of sustainability.

References

- Arts, J. and Faith-Ell, C. (2012), “New governance approaches for sustainable project delivery”, *Procedia-Social and Behavioral Sciences*, Vol. 48 No. 1, pp. 3239-3250.
- Birks, M. and Mills, J. (2015), *Grounded Theory: A Practical Guide*, Sage Publications, Los Angeles, CA.

- BRE (2004), *Assessment of Sustainability Tools*, Building Research Establishment, Glasgow.
- BREEAM (2016), "What is BREEAM?", available at: www.breeam.org/about.jsp?id=66 (accessed August 14, 2016).
- CEEQUAL (2016), "Assessment methodology for projects and long-term contracts", available at: www.ceequal.com/methodology/ (accessed August 15, 2016).
- Cheung, E. (2009), "Developing a best practice framework for implementing PPPs in Hong Kong", unpublished thesis doctoral thesis, Queensland University of Technology, Brisbane.
- Clifton, C. and Duffield, C.F. (2006), "Improved PFI/PPP service outcomes through the integration of alliance principles", *International Journal of Project Management*, Vol. 24 No. 7, pp. 573-586.
- Cole, R. and Larsson, N. (1999), "GBC'98 and Gbtool – background", *Building Research and Information*, Vol. 27 Nos 4/5, pp. 379-392.
- Colverson, S. and Perera, O. (2012), *Harnessing the Power of Public-Private Partnerships: The Role of Hybrid Financing Strategies in Sustainable Development*, International Institute for Sustainable Development, Winnipeg.
- Creswell, J.W. (2007), *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*, 2nd ed., Sage Publications, Thousand Oaks, CA.
- Curnow, W., Jefferies, M.C. and Chen, S.E. (2005), "Unsustainable bidding costs: a critical issue for public-private partnerships", *Proceedings of the Conference on Public Private Partnerships: Opportunities and Challenges, The University of Hong Kong and The Hong Kong Institution of Engineers (Civil Division), Hong Kong*, pp. 35-43.
- Curwell, J., Hamilton, A. and Cooper, I. (1998), "The BEQUEST network: towards sustainable urban development", *Building Research and Information*, Vol. 26 No. 1, pp. 56-65.
- Davis, S., Brown, S., Dixon, M., Borden, R. and Montfort, D. (2013), "Embedded knowledge in transportation engineering: comparisons between engineers and instructors", *Journal of Professional Issues in Engineering Education & Practice*, Vol. 139 No. 1, pp. 51-58.
- DEA (2011), "National public-private partnership policy: draft for consultation", Department of Economic Affairs, Ministry of Finance, New Delhi.
- DEFRA (2010), "Sustainable procurement in government: guidance to the flexible framework", Department of Environment, Food and Rural Affairs, United Kingdom Government, London.
- Devuyst, D. (1999), "Sustainability assessment: the application of a methodological framework", *Journal of Environmental Assessment Policy and Management*, Vol. 1 No. 4, pp. 459-487.
- DHPW (2014), "Procurement guidance: integrating sustainability into the procurement process", Procurement Transformation Division, Department of Housing and Public Works, Queensland Government, Maryborough.
- El-Gohary, N.M., Osman, H. and El-Diraby, T.E. (2006), "Stakeholder management for public private partnerships", *International Journal of Project Management*, Vol. 24 No. 7, pp. 595-604.
- Fellows, R.F. and Liu, A.M. (2008), *Research Methods for Construction*, John Wiley and Sons Publications, Oxford.
- Fernández-Sánchez, G. and Rodríguez-López, F. (2010), "A methodology to identify sustainability indicators in construction project management – application to infrastructure projects in Spain", *Ecological Indicators*, Vol. 10 No. 6, pp. 1193-1201.
- George, C. (2001), "Sustainability appraisal for sustainable development: integrating everything from jobs to climate change", *Impact Assessment and Project Appraisal*, Vol. 19 No. 2, pp. 95-106.
- Gibson, R.B. (2006), "Sustainability assessment: basic components of a practical approach", *Impact Assessment and Project Appraisal*, Vol. 24 No. 3, pp. 170-182.
- Gibson, R.B., Selma, H., Susan, H., James, T. and Graham, W. (2005), *Sustainability Assessment: Criteria and Processes*, Earthscan Publication, London.

- Gilmour, D., Blackwood, D., Banks, L. and Wilson, F. (2011), "Sustainable development indicators for major infrastructure projects", *Proceedings of the ICE – Municipal Engineer*, Vol. 164 No. 1, pp. 15-24.
- Glaser, B.G. and Strauss, A.L. (1967), *The Discovery of Grounded Theory: Strategies for Qualitative Research*, Wiedenfeld and Nicholson, London.
- Graham, S. and Marvin, S. (2001), *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition*, Psychology Press, Routledge, London.
- Gupta, A.P. (2011), "Governance mechanisms for infrastructure PPPs: focus on India", unpublished thesis MS thesis, MIT, Cambridge.
- Hallowell, M.R. and Gambatese, J.A. (2010), "Qualitative research: application of the Delphi method to CEM research", *Journal of Construction Engineering and Management*, Vol. 136 No. 1, pp. 99-107.
- Hill, J. and Collins, J. (2004), *PFI Meeting the Sustainability Challenge*, Green Alliance, London.
- HK-BEAM (2016), "BEAM plus assessment tool", available at: www.beamsociety.org.hk/en_beam_assessment_project_1.php (accessed August 14, 2016).
- Hutchison, A.J., Johnston, L.H. and Breckon, J.D. (2010), "Using QSR-NVivo to facilitate the development of a grounded theory project: an account of a worked example", *International Journal of Social Research Methodology*, Vol. 13 No. 4, pp. 283-302.
- Jenkins, B., Annandale, D. and Morrison-Saunders, A. (2003), "The evolution of a sustainability assessment strategy for Western Australia", *Environmental and Planning Law Journal*, Vol. 20 No. 1, pp. 56-65.
- Kumaraswamy, M.M. and Anvuur, A.M. (2008), "Selecting sustainable teams for PPP projects", *Building and Environment*, Vol. 43 No. 6, pp. 999-1009.
- Leech, N.L. and Onwuegbuzie, A.J. (2008), "Qualitative data analysis: a compendium of techniques and a framework for selection for school psychology research and beyond", *School Psychology Quarterly*, Vol. 23 No. 4, pp. 587-604.
- LEED (2016), "LEED – rating systems", available at: <http://in.usgbc.org/resources/list> (accessed August 27, 2016).
- Lim, S. and Yang, J. (2008), "Developing an integrated decision model for the enhancement of sustainability deliverables for Australian road infrastructure", *Proceeding of World Sustainable Building Conference, Melbourne, September 21-25*.
- Mahalingam, A. (2010), "PPP experiences in Indian cities: barriers, enablers, and the way forward", *Journal of Construction Engineering and Management*, Vol. 136 No. 4, pp. 419-429.
- Miles, M.B., Huberman, A.M. and Saldana, J. (2013), *Qualitative Data Analysis: A Methods Sourcebook*, Sage Publications, London.
- MNRE and TERI (2010), *GRIHA Manual – Volume 1*, The Energy and Resource Institute and Ministry of New and Renewable Energy, Government of India, New Delhi.
- MoE (2015), "Law concerning the promotion of procurement of eco-friendly goods and services by the state and other entities", Ministry of the Environment, Government of Japan, Tokyo.
- MoED (2010), "Integrating sustainable procurement into practice", Government , Procurement Development Group, Ministry of Economic Development, Government of New Zealand, Wellington.
- MoEF (2011), "Sustainable development in india: stocktaking in the run up to RioC20", Ministry of Environment and Forests, Government of India, New Delhi.
- MoF (2005), "General financial rules, 2005", Ministry of Finance, Government of India, New Delhi.
- MoF (2012), "The Public Procurement Bill, 2012", Ministry of Finance, Government of India, New Delhi.
- Morrison-Saunders, A. and Hodgson, N. (2009), "Applying sustainability principles in practice: guidance for assessing individual proposals", *29th Annual Conference of the International Association for Impact Assessment, Impact Assessment and Human Well-Being, Accra*, pp. 1-6.
- O'Neill, M. (2013), "The NVivo Toolkit", QSR International Pty Ltd, Melbourne.

- Planning Commission (2009), "Guidelines for public-private partnerships: request for proposal", Planning Commission, New Delhi.
- Planning Commission (2011), "Faster, sustainable and more inclusive growth: an approach to the Twelfth Five Year Plan", Planning Commission, New Delhi.
- Planning Commission (2013), "Draft Compendium of PPP Projects in infrastructure", Planning Commission, New Delhi.
- Regeczi, D. (2005), "Limited partnership – the lack of sustainable development in relation to participation in hungarian public-private partnerships", *Business Strategy and the Environment*, Vol. 14 No. 4, pp. 205-215.
- Ryan, B. (2004), "Public private partnerships and sustainability principles guiding legislation and current practice", Dublin Institute of Technology, Dublin.
- Sadler, B. (1999), "A framework for environmental sustainability assessment and assurance", in Petts, J. (Ed.), *Handbook of Environmental Impact Assessment*, Blackwell Publication, Oxford, pp. 12-32.
- Shah, S.H. and Gibson, R.B. (2013), "Large dam development in India: sustainability criteria for the assessment of critical river basin infrastructure", *International Journal of River Basin Management*, Vol. 11 No. 1, pp. 33-53.
- Sheate, W.R., Dagg, S., Richardson, J., Aschemann, R., Palem, J. and Steen, U. (2003), "Integrating the environment into strategic decision-making – conceptualizing policy SEA", *European Environment*, Vol. 13 No. 1, pp. 1-18.
- Shen, L., Wu, Y. and Zhang, X. (2011), "Key assessment indicators for the sustainability of infrastructure projects", *Journal of Construction Engineering and Management*, Vol. 137 No. 6, pp. 441-451.
- Strauss, A. and Corbin, J. (1998), *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, Sage Publications, London.
- TERI (2013), "Engagement with sustainability concerns in public procurement in India: why and how", The Energy and Resources Institute, New Delhi.
- Tiwari, S. and Ashish, A. (2013), "A review on cancellation of PPP projects in India", *International Journal of Agriculture Innovations and Research*, Vol. 2 No. 6, pp. 202-213.
- Ugwu, O.O. and Haupt, T.C. (2007), "Key performance indicators and assessment methods for infrastructure sustainability – a South African construction industry perspective", *Building and Environment*, Vol. 42 No. 2, pp. 665-680.
- UNEP (2013), "Sustainable public procurement: a global review", United Nations Environment Programme, Nairobi.
- Wiek, A. and Larson, K. (2012), "Water, people and sustainability: a systems framework for analyzing and assessing water governance regimes", *Water Resources Management*, Vol. 26 No. 11, pp. 3153-3171.
- Zhang, S., Chan, A.P., Feng, Y., Duan, H. and Ke, Y. (2016), "Critical review on PPP research: a search from the chinese and international journals", *International Journal of Project Management*, Vol. 34 No. 4, pp. 597-612.
- Zhou, L., Keivani, R. and Kurul, E. (2013), "Sustainability performance measurement framework for PFI projects in the UK", *Journal of Financial Management of Property and Construction*, Vol. 18 No. 3, pp. 232-250.

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