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Performance evaluation of public-private partnerships (PPPs) in developing countries: A case study of Bangladesh

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Declaration of originality

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

[redacted]

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Date

Abstract

Since the emergence in the early 1990s, PPP options have become increasingly popular to the governments of both developed and developing countries. On average, US$ 95b are invested annually in the developing countries in the form of PPP options up until 2017. However, a mixed result is documented with respect to their performances. PPP arrangements include multiple stakeholders that have diverse interests associated with their particular affiliations, and accordingly the performance expectations of these stakeholders also differ. Traditional approaches to performance evaluation are unable to capture all of the expectations to be included in the process of PPP project evaluation. Hence, using appropriate performance indicators and analysing their relative importance in influencing the performance score of particular projects remains unexplored in the developing country context.

Against this backdrop, this study examines current practices of PPP performance evaluation, develops a framework of weighted performance indicators for developing countries and applies the model in a number of PPP projects in Bangladesh. A mixed-method approach has been used, which includes the analytical hierarchy process (AHP) for establishing weights of the key performance areas (KPAs) and associated indicators and a case study method for applying the developed model to selected PPP projects in Bangladesh.

Results show that ‘financing’, ‘planning and initiation’ and ‘transparency and accountability’ are the most important KPAs in evaluating PPP performances in Bangladesh and ‘feasibility analysis’, ‘life cycle evaluation and monitoring’ and ‘optimal risk allocation’ are the most significant performance indicators. Unlike traditional performance evaluation methods, a prioritised set of performance indicators and KPAs for the PPPs of Bangladesh has been identified. The findings also reveal that sincere government commitment is relatively more important for the success of PPPs than the enactment of enabling legislation in the context of developing countries. This suggests more efforts are required to be employed by the host government to build confidence in the private partner selected for engagement in PPP arrangements. Furthermore, a framework for performance evaluation of power sector PPPs, based on the KPAs, has been proposed. This could be used for evaluating the performance of power PPPs in a more objective and systematic way in Bangladesh and other South Asian countries. Finally, the weighted process applied to the various performance indicators provides an improved understanding of the relative significance of KPAs and their component indicators.

Attaching weights to the KPAs and performance indicators of PPPs, and applying those weights to derive individual project scores in a developing country context, especially in Bangladesh, represents an innovation and thus a contribution to the PPP performance literature. Awareness of the outcomes of the weighted performance evaluation process developed in this study could help project implementers and regulators prioritise their attention and resource allocation decisions related to achievement of performance improvement on the more significant key performance areas. The weighted process is expected to contribute to reducing biases of either perceived Likert scaled scores or only the weightings in PPP performance evaluation.

KEYWORDS: Analytical hierarchy process (AHP); key performance areas (KPAs); performance indicators; public-private partnerships (PPPs); infrastructure provision.

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List of abbreviations

A	Availability of services
ADB	Asian Development Bank
ADP	Annual development programme
AES	Applied Energy Services
AHP	Analytical hierarchy process
AIJ	Aggregating individual judgement
AIP	Aggregating individual priorities
ANP	Analytical network process
ANOVA	Analysis of variance
BDT	Bangladeshi Taka
BEPRC	Bangladesh Energy and Research Council
BERC	Bangladesh Energy Regulatory Commission
BIFFL	Bangladesh Infrastructure Finance Fund Ltd
BIM	Building information modelling
BLT	Build lease transfer
BOO	Build own operate
BOT	Build operate transfer
B-R	B-R Powergen Ltd
BTO	Build transfer operate
BPDB	Bangladesh Power Development Board
BROT	Build rehabilitation operate transfer
C	Cost performance
CDC	Commonwealth Development Corporation
CFA	Confirmatory factor analysis
CI	Consistency index
CO	Construction and operation
COD	Commercial operation date
CR	Consistency ratio
CSF	Critical success factor
DB	Design build

DBF	Design build finance
DBFO	Design build finance operate
DBOM	Design build operate maintain
DESCO	Dhaka Electric Supply Company
DNPGL	Dhaka North Power Generation Ltd
DPDC	Dhaka Power Distribution Company
DPI	Disclosure of project information
DS	Dispute settlement
DSM	Demand side management
DSPGL	Dhaka South Power Generation Ltd
E	Economy of services
ECS	Efficient concessionaire selection
EF	Environment friendliness
EG	Employment generation
EGCB	Electricity Generation Company of Bangladesh
EPC	Engineering, procurement and construction
EPEC	European PPP Expertise Centre
ERM	Efficient risk management
EUS	End user satisfaction
EVM	Eigenvalue method
F	Financing
FA	Feasibility assessment
FC	Financial cost
FMO	The Netherlands Development Finance Company
FSA	Fuel supply agreement
FT	Fairness and transparency
G2G	Government to Government
GCI	Geometric consistency index
GL	Government liabilities
GoB	Government of Bangladesh
Gwh	Gigawatt per hour
H412	412MW Haripur Power Plant
HFO	Heavy fuel oil

HPL	360MW Haripur Power Ltd
HRD	Human Resource Development
HSD	Honestly significant difference
ImA	Implementation agreement
IA	Implementability assessment
ICB	Investment Corporation of Bangladesh
ID	Infrastructure development
IDA	International Development Association
IDCOL	Infrastructure Development Company Ltd
IFB	Invitation for bid
IFC	International Finance Corporation
IIFC	Infrastructure Investment Facilitation Company
IL	Integration of locals
IMF	International Monetary Fund
IPO	Initial public offerings
IPPs	Independent power producers
IPFF	Investment Promotion and Financing Facility
IPS	Innovation in public sector
JICA	Japan International Cooperation Agency
JIT	Just in time
KPA	Key performance area
KPCL	110MW Khulna Power Company Ltd
KPI	Key performance indicator
LCEM	Life cycle evaluation and monitoring
LCM	Life cycle maintainability
LLA	Land lease agreement
MLR	Multiple linear regression
MO	Meeting objectives
MPEMR	Ministry of Power, Energy and Mineral Resources
MW	Megawatt
Mwh	Megawatt hour
NA	Needs assessment
NCCBL	National Credit and Commercial Bank Ltd

NPV	Net present value
NWZPDC	North West Zone Power Distribution Company
OECD	Organisation for Economic Co-operation and Development
OMT	Other monthly tariff
ORA	Optimal allocation of risk
ORS	Optimal revenue sharing
P	Profitability
PBS	Polli Biddut Somity
PCA	Principal component analysis
PG	Payments and government guarantees
PGCB	Power Grid Company of Bangladesh
PFI	Private finance initiative
PI	Planning and initiation
PIT	Public interest test
PMS	Performance measurement system
PPA	Power purchase agreement
PPI	Private participation in infrastructure
PPP	Public-private partnership
PPPTAF	Public-private partnership Technical Assistance Fund
PRG	Partial risk guarantees
PrKS	Private sector knowledge and skill
PRR	Partners roles and responsibilities
PrS	Project sustainability
PS	Partners satisfaction
PSC	Public sector comparator
PSD	PPP sector development
PSMP	Power sector master plan
PSPGP	Private Power Generation Policy 1996
PuCC	Public sector capacities in coordination
Qa	Quality of assets
Qs	Quality of services
RC	Responsiveness of concessionaire
RCOD	Required commercial operation date

RD	Relationship dilemma
REB	Rural Electrification Board
RFP	Request for proposal
RFQ	Request for quotation
RGMM	Row geometric mean method
RI	Random index
ROE	Return on equity
RPCL	Rural Power Company Ltd
RQ	Research question
SC	Standardised contract
SCM	Selection criteria and method
SED	Socioeconomic development
SIPP	Short-term independent power producer
SMART	Specific, measurable, achievable, reliable and time bound
SO	SMART objectives
SP	Sustainability of partnerships
SPV	Special purpose vehicle
SREDA	Sustainable and Renewable Energy Development Authority
SS	Stakeholder satisfaction
SZPDC	South Zone Power Distribution Company
T	Tendering
TA	Transparency and accountability
TC	Time consideration
Tk/Kwh	Taka per kilowatt hour
TR	Trust and respect
TOPSIS	Technique for order of preference by similarity to ideal solution
UAE	United Arab Emirates
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
US	United States
VFM	Value for money
VGF	Viability Gap Fund
WB	World Bank

WQI	Water quality index
WZPDC	West Zone Power Distribution Company

Chapter One: Introduction

1.1 Background of the study

Two aspects of public-private partnerships (PPPs) provide the motivating points for this study: formulating a performance measurement approach and evaluating the actual performance of individual PPPs using this approach in the context of developing countries. A detailed discussion of the background of the study follows, starting from a global perspective of PPPs and then focusing on the specific research topic undertaken for this study.

1.1.1 A global trend of PPPs

The PPP concept emerged in the early 1990s in the United Kingdom (Yescombe, 2011). At present, PPPs have become a popular option for governments of both developed and developing countries, as they seek to reach the strategic objective of achieving value for money (VFM) from the public investment through partnerships with the private sector (J. Liu, Love, Smith, Regan, & Palaneeswaran, 2015; Osei-Kyei & Chan, 2017a; Raisbeck, Duffield, & Xu, 2010). However, mixed results are documented with respect to the performance of PPPs, irrespective of the country status. Unlike traditional methods, a PPP arrangement includes multiple stakeholders who have diverse interests associated with their affiliations; accordingly, performance expectations from the PPPs also differ (Hodge & Greve, 2017).

Most of these expectations depend on which performance aspects of PPPs are measured, and for whom (Hodge & Greve, 2017). Traditional approaches to performance evaluation of construction projects, for example, are unable to capture all of the performance expectation necessary for inclusion in the process of evaluation (J. Liu, Love, Davis, Smith, & Regan, 2015).

1.1.2 Study focus on the PPPs of developing countries

This study focuses on a developing country perspective with respect to PPP performance evaluation. Up until 2017, US$ 95b (on average) was invested annually in developing countries via private sector participation (World Bank PPI Database, 2018). This trend indicates a growing attractiveness of PPPs among governments from developing countries (Osei-Kyei & Chan, 2017a), especially those in the middle-income category that are losing their eligibility for concessional loans from international organisations such as the World Bank and the International Monetary Fund. While this study focuses on developing countries, it recognises that these nations, generally speaking, have a relatively poor operating and institutional environment, with more scope for opportunism and corruption, factors which are associated with the success or failure of PPP projects (Hammami, Ruhashyankiko, & Yehoue, 2006; Panayides, Parola, & Lam Jasmine, 2015; Percoco, 2014; Trebilcock & Rosenstock, 2015). PPPs in the developing countries also often underperform due to a weaker financial market, unstable macroeconomic factors, and a lack of political commitment (Sanghi, Sundakov, & Hankinson, 2007).

1.1.3 Relative importance of PPP performance indicators

To measure PPP performance, different approaches have been applied previously. An objective-based measurement approach has also been used to measure whether the initially specified objectives have been achieved, compared with pre-specified standards (Lam & Javed, 2015). Governments often evaluate project success or failure by considering the political purpose and governance strength of the project, rather than by using utilitarian characteristics (Hodge & Greve, 2017). A theory-based performance evaluation was proposed by Jeffares et al. (2009), with six performance domains including policy goal achievement, following democratic norms, innovation in the public sector, connectivity to inspire innovation, coordination to achieve collaborations and coalition to achieve sustainable partnerships. Likewise, a key performance indicator (KPI) system, one of the most prominent approaches currently in use, focuses on a number of indicators to measure different dimensions of performance, such as efficiencies, outcomes, service qualities, financial performances, process, and activities (OECD, 2008; Regan, Smith, & Love, 2011). This approach assesses the performance of the different indicators separately and does not attempt to combine these assessments into a single score that permits comparison across different PPP projects.

A project success index (Osei-Kyei & Chan, 2017a) developed in earlier research was based on critical success factors (CSF), in which ex-post performance indicators were ignored. Furthermore, using a Likert scale survey, Yuan et al. (2012) derived an estimate of the relative importance of the indicators without differentiating between the operating contexts of the PPPs. Accordingly, the results found in such a study cannot be used for generalising the performance framework applicable to a specific group of countries such as developing countries. Likewise, in the context of some European countries, the ‘overall’ success of transport PPPs was measured, but the regional focus in this study and the research approach to measuring the relative importance of the performance are different (Liyanage & Villalba-Romero, 2015).

1.2 Research gaps, research questions and contribution

From this background, conventional performance evaluation approaches seem to be used for evaluating PPP performance. These approaches appear to be inadequate because the relative significance (weight) of the various performance indicators, which can impact an overall performance assessment, has not been measured. Identifying the relative importance of the various performance indicators is important because it allows weights to be applied when assessing PPP performance. In using an unweighted indicator system, an equal weighting is implicitly given to all indicators when measuring the overall performance. But the weighted process includes the relative importance of the indicators as well as the actual performance (score) in measuring the performance related to different performance areas and to assess the overall performance of a PPP project. This interaction between weights and actual performance allows the analyst to accurately assess the relative contribution of the different performance areas, which include different factors or performance objectives that eventually contribute to the success of the PPPs. Therefore an improved understanding, gained on the relative importance of the indicators by applying the weighted process, can assist in focusing relatively more important performance areas for the improvement of overall performance of the projects and for adopting policy responses to target the source of potential failure of PPPs.

For example, good performances related to areas such as financing arrangement, transparency in procurement and planning and initiation in Haripur Power Ltd in Bangladesh are reported as elements contributing to making this project successful (M. Khan, Riley, & Wescott, 2012; World Bank, 2014a). But it is unclear how much these performance areas are significant in assessing the performance of this project, relative to others: for instance, to the socioeconomic development area. This will be explored later in this study by applying the analytical hierarchy process (AHP) approach.

The AHP method will be used, because of its relative advantages over the other methods available, for establishing weights of criteria/performance indicators. It has been applied to a wide range of areas in evaluating performance, but has not yet been used in establishing weights for KPAs and indicators of PPPs in the developing country context, especially in Bangladesh. In PPPs, it has appeared to have some applications in different contexts and concentrations, including identifying design development factors in

Australia (Raisbeck & Tang, 2013), SWOT analysis in China (Yuan, Guang, Wang Xiaoxiao, Li Qiming, & Skibniewski, 2012) and risk assessment in China (Li & Zou, 2011). Other applications are focused on critical success factors as well.

However, the application of the AHP in this study is different from that of the previous studies in terms of context and focus. Specifically, experts in relation to PPPs in Bangladesh (context) are surveyed to develop weights for the KPAs and indicators (concentration) of PPP perfroamnce evalaution. The major contribution of this study is thus a methodological innovation in an application of the weights developed by using the AHP in a developing country context. The resulting performance evaluation approach (weighted KPAs and indicators) is applied to a number of completed PPP projects to demonstrate how it could work to improve our understanding of actual PPP performance in a developing country context. Bangladesh, as a developing country, has been selected for a case study in the application of this new approach.

Bangladesh is considered as an ideal case for analysis because firstly it has become one of Asia's most remarkable and unexpected success stories in recent years (Basu, 2018). It has a PPP operating environment as well as economic status that is comparable to that of other countries in the region. PPP arrangements first appeared in this country in the mid-nineties, almost immediately after they materialised in the developed countries (The National Parliament GoB, 2016), and initially, a number of executed PPPs showed good performances in the power sector. Afterwards, schedule lapses and cost overruns have become common features (M. Khan et al., 2012). Nevertheless, an interest in using the PPP option in different sectors has grown recently (BPDB Annual Report, 2017; PPP Authority, 2018). Conversely, very little evidence relating to actual PPP performance evalution exists for this nation and for other developing countries.

These important and unaddressed research gaps raise an overall research question: *How can the performance of public-private partnership projects in developing countries be measured and evaluated?*

In order to find answers to this question, a set of research questions (RQ) are framed:

RQ1. What are the most appropriate indicators and hence KPAs of PPPs in developing countries?

RQ2. What are the weights of the different KPAs and indicators of PPP performance in developing countries and how do they differ from those of developed countries?

RQ3. What are the most important performance areas of the power sector PPPs in Bangladesh using a traditional approach of analysing case experiences?

RQ4. What are the actual performance scores of the sample of power sector PPPs in Bangladesh applying developed weights of KPAs and indicators and how do they differ from unweighted scores derived from industry experts and/or readily available performance assessments?

1.3 Methodology

A mixed-method approach is considered useful for this study. As our research questions suggest, the literature on performance evaluation of PPPs has been reviewed and forty-one performance indicators have been identified in the first phase. These indicators are grouped into eight KPAs. In the second phase, a structured questionnaire based on the AHP method has been used to elicit perceptions of PPP experts in Bangladesh on the relative importance of these KPAs and their associated indicators. The survey responses have been processed and calculated using Microsoft Excel and Expert Choice (software), and ultimately the weights of the various KPAs and indicators are established.

In the third phase, the case study component of the study begins with reporting the case experiences related to a small number of the selected power sector PPPs that have been implemented in Bangladesh. In this stage, a project-specific structured questionnaire survey was administered to each of the spokespersons from the selected projects to obtain their perceptions (scores) for their project performance using a set of indicators. The obtained scores are then interacted (weighted) with the weights already established by using the AHP method. Finally, these findings are examined and linked to the project experiences, and arguments are developed, based on results, with the support of the previously reviewed literature. Further details on this methodology have been provided in chapter four.

1.4 Research contribution

The study contributes to the literature in several ways. *First*, attaching weights to the KPAs and performance indicators of PPPs, and applying those weights to derive individual project scores in a developing country context, especially in Bangladesh, represents an innovation and thus a contribution to the PPP performance literature. Unlike traditional performance evaluation methods, a prioritised set of performance indicators and KPAs for the PPPs of Bangladesh has been identified. *Second*, it is argued that government determination/commitment is relatively more important to the success of PPPs than is the enactment of laws and regulations in the context of developing countries. This finding suggests that more efforts are required to be employed by the host government to build confidence in the private sector partner selected for engagement in

PPP arrangements. *Third*, a framework for performance evaluation of power sector PPPs, based on the KPAs, has been proposed, which could be used for evaluating the performance of power PPPs in a more objective and systematic way, not only in Bangladesh but also in other developing countries in the South Asian region. *Fourth*, the weighted process applied to the various performance indicators provides an improved understanding of the relative significance of KPAs and their component indicators. This in turn could help project implementers and regulators by informing them of the relatively more important performance areas, for which special attention should be paid in relation to more targeted resource allocation. This research, therefore, adds value to the literature of PPP performance evaluation, especially in the developing country context.

1.5 Structure of the thesis

The thesis has been reported in eight chapters.

Chapter one presents an introduction to the study. It focuses mainly on the background of the study, the research gaps and their related research questions, the methodology in brief, the contribution to the knowledge, and the structure of this thesis.

Chapter two presents a review of the literature on performance evaluation practices in PPPs and finds a research gap focusing on the developing country perspective. In particular, this chapter presents discussion of the development of performance evaluation systems, the global experiences of PPPs, the performance evaluation practices in developing countries, and the definitions of KPAs and indicators.

Chapter three provides a review of PPP related literature in the developing countries, focusing on the power sector in Bangladesh. The discussion includes key concepts and typology of PPPs, as well as emerging needs for and challenges to implementing PPPs in developing countries. This chapter also presents a background of PPP initiatives in Bangladesh, focusing on the PPP implementation in the power sector.

Chapter four outlines details of the methodology used in this study. It presents details of the rationale for selecting methods, the research process and the types of methods adopted, and points to the potential limitations of this study. This chapter also presents details of the AHP method used for establishing weights of the KPAs and indicators, the case study method employed for analysing the selective case experiences and the application of the developed weights to those project cases to derive project performance scores.

Chapter five presents research findings related to RQ2: what are the weights of the different KPAs and indicators in developing countries and how do they differ from those of developed countries? This chapter presents details on establishing weights, including the design and conduct of the survey and the respondent selection criteria, and presents critical discussion on the results derived in this chapter.

Chapter six presents a case study and an assessment of individual project performances of the selected power generation PPPs in Bangladesh. In particular, this chapter addresses RQ3: what are the most important performance areas of power sector PPPs in Bangladesh using a traditional approach of case experiences. A conceptual framework of the pathway of PPP performance and the concept of a sustainable energy system are used for analysing these case experiences.

Chapter seven presents the outcome of research findings related to RQ4: what are the actual performance scores of the sample of power sector PPPs in Bangladesh applying developed weights of KPAs and indicators and how do they differ from unweighted scores derived from industry experts and/or readily available performance assessments? This chapter provides details on designing a questionnaire and conducting surveys with experts related to the six selected projects, the results from the survey, and the analysis and discussion of those results.

Chapter eight concludes the study by providing overall conclusions, research limitations and directions for future research. In particular, this chapter reviews the research questions initially formulated, briefly presenting answers to those research questions and the value and significance of the study. This chapter then presents research limitations, related policy recommendations, and directions for future research.

Chapter Two: Performance evaluation of PPPs: A focus on developing countries

2.1 Introduction

This chapter reviews the literature on the performance evaluation of PPPs, focusing in particular on the various methodological approaches and performance experiences (Section 2.2, Section 2.3). It is argued that these approaches cannot be empirically applied without modification to developing countries, because the relative importance (measured by weights) of the performance indicators are likely to be quite different to those for developed countries (Section 2.4). Unique weights need to be determined for developing countries (Section 2.5, Section 2.6). The chapter notes that Bangladesh is chosen as the country of application (discussed further in Chapter 3) and that the analytical hierarchy process (AHP) is chosen as the method to establish the weights for the performance indicators (Section 2.7 and discussed in Chapter 4).

2.2 Development of PPP performance evaluation

Organisations achieve their goals by satisfying their customers through better efficiency and effectiveness than are shown by their competitors. Although this definition is from a marketing perspective, it has wider implications for both the public and private organisations in achieving their goals (Kotler, 1984). In addition, organisations should consider internal and external causes that might influence their courses of actions (Slack, 1991). Reflecting these causes, Neely et al. (2005) argued that organisational performance level is a function of the efficiency and effectiveness of the course of an action. Three things are relevant: a) the performance measurement, defined as “the process of quantifying efficiency and effectiveness of action”; b) the performance measure, defined as “a metric used to quantify the efficiency and/or effectiveness of an action”; and c) the performance measurement system, defined as “the set of metrics used to quantify both the efficiency and effectiveness of actions” (Neely, Gregory, & Platts, 2005, p. 1229).

Throughout the history of measuring organisational performance, 'success' was an ultimate concern used to measure any attainment of organisational objectives (Kennerley & Neely, 2003). Before the 1980s, time assessment was predominantly a basis by which to measure organisational performance (Bruns, 1998). The double entry accounting system was used to measure transactions among traders. With the advent of the concept of ownership separation from the firm's management, the measure of returns on investment (ROE) was applied for the evaluation of the performance (Johnson, 1983). Traditional performance measures seem to be insufficient in rapidly changing business environments, as they are based on historical information, are only internally focused, ignore customer or competitor concerns and lack an organisational strategic aspect (Kaplan & Norton, 1992; Kennerley & Neely, 2003). These shortcomings have led to a considerable amount of time and resources being invested in developing a comprehensive performance measurement system (PMS) that would extend the focus onto the contexts and objectives of organisations.

A traditional framework of cost, time, and quality is insufficient for evaluating very complex PPP ventures in both developed and developing countries. This framework needs to be extended to a broader form of evaluation mechanism, irrespective of the countries in which PPP projects are implemented (Love, Liu, Matthews, Sing, & Smith, 2015; Raisbeck et al., 2010). Designing an appropriate performance evaluation framework for PPPs has been argued to be more challenging than that for conventional public procurement (Grimsey & Lewis, 2002). In addition, no single method seems to fit all PPP types since they are so varied in attributes and purposes.

Review of the theoretical development of PPPs suggests that currently, there is no such notable performance measurement framework in PPPs. However, the performance prism, a conceptual framework of lifecycle-based PPP performance measurement approach, has recently been developed (J. Liu, Love, Davis, et al., 2015).

2.3 The performance prism framework

"The performance prism framework is a tool which can be used by management teams to influence their thinking about what the key questions are that they want to address when seeking to manage their business" (Neely et al. 2001). Considering this viewpoint, a dynamic life-cycle performance measurement framework that consists of a set sixty-three core indicators into five perspectives has been developed (J. Liu, Love, Davis, et al. 2015). Some of these indicators are common in the developing countries perspective and thus considered PPP performance indicators in our research. However, this framework ignored the relative importance of the indicators in performance evaluation.

2.4 Global experiences of PPP performances

2.4.1 Performances in the developed countries: A critical review

Developed countries such as the UK, Canada, and Australia, where PPP first materialized, have shown relatively better success because their governments continuously evaluate PPP arrangements, with respect to achieving the best value for money. The levels of performance differ across jurisdiction that varies, depending on their institutional qualities, economic status, cultural attributes, financial market, and other factors. In developed countries, changes are brought into as and when required (KPMG, 2010). Advanced issues, such as stable risk allocation, designing robust business cases and effective control of concessionaire, are considered to be priority issues for developed countries (De Jong, Mu, Stead, Ma, & Xi, 2010). Relationship management in developed countries is more focused on maintaining sustainable partnerships to achieve a superior value of PPPs (Zou, Kumaraswamy, Chung, & Wong, 2014). Designing and bundling require a high level of expertise, which the only developed countries might have the luxury of demanding (Iossa & Martimort, 2015).

In the UK, PPP was first adopted early in the 1990s; since then the PFI model has been implemented in various sectors at the national level, and technical advice has been provided to local government authorities. By 2006, around 500 PPP projects were in operation, which demonstrated PPPs popularity in the UK (Yescombe, 2011). In the present decade, a range of sectors have adopted the PPP option, including education, health, and defence departments. Initially, many local authorities did not cooperative in using PPPs, but PFIs in the education sector boosted their confidence in PPP effectiveness (Osei-Kyei, 2017).

PPPs have shown superior performance in Australia as well. Australian PPPs have demonstrated cost efficiency over traditional procurement to an extent of 30.8 percent (when measured from the contractual commitment to final outcome). They have also shown a schedule performance that was 3.4 percent ahead of average time, whereas the traditional project was completed 23.5 percent behind the scheduled time (Raisbeck et al., 2010). The PPP market is mature and is considered a successful one among the advanced nations for achieving a better value for money though there are noteworthy mega project failures such as CLEM7, Sydney Harbour Tunnel. However, improvement is needed for non-uniform accountability and transparency system, private sector capacity constraints, incomplete contract, unfair bid market, and sector suitability for PPP projects (Regan et al., 2011).

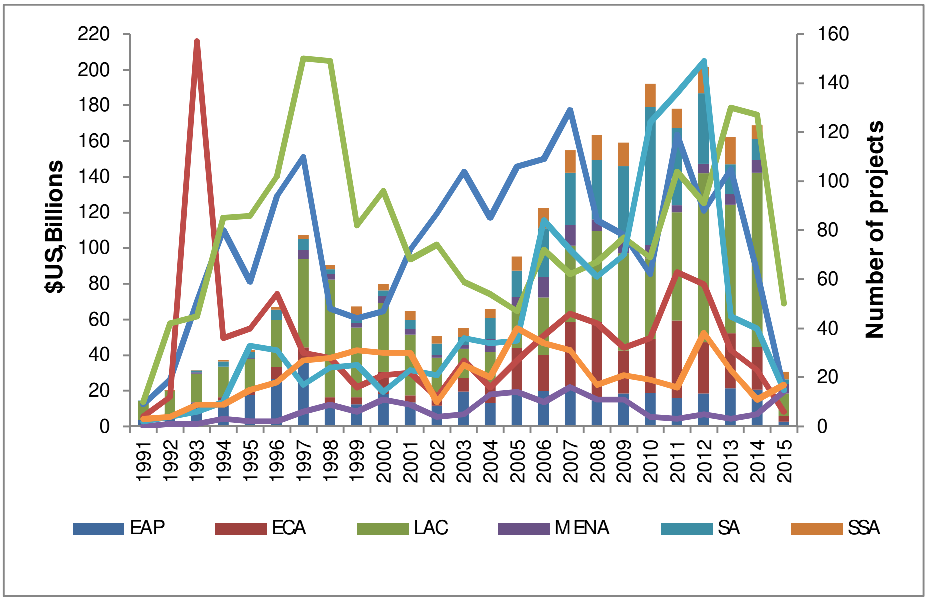
In the USA and Canada, similar and well-structured PPPs have been implemented. In Canada, diverse sectors are involved in PPPs; in the USA, transport infrastructure seems to be the major sector using PPPs. Unlike the UK, where design-build-finance-operate (DBFO) concession type was largely used in the transport sector, the US applies different concessions that include design-build (DB), design-build-finance (DBF) and design-build-operate-maintain (DBOM). The level of performance in these countries appears to be moderate, although Canada seems ahead of the USA, which could have extended use of PPPs to various sectors (Osei-Kyei, 2017; Reinhardt, 2011). Other developed countries, including Japan and some European countries, have also shown interest in adopting PPP options (Yescombe, 2011).

2.4.2 Performances in the developing countries: A critical review

Increasing PPP investment trend

The PPP concept emerged in developing countries in the mid-nineties. Since then PPP investment has grown significantly. Up until 2016, US$ 95b on average was invested annually in developing countries by private sector participation (World Bank PPI Database, 2018). This amount represents approximately 20 percent of the total infrastructure investment in the developing countries (Klein, 2015). This growing trend indicates the popularity of the PPP option among governments across developing countries. Figure 2.1 shows PPP investment trends in the developing countries from 1991 to 2015 in billion US$ and in number of projects. Latin America and the Caribbean have the highest of these except from 2002 to 2004. From 2005 to 2012, the PPP investment around the developing countries more than doubled, increasing to approximately 200 billion US$ in 2014 from 100 billion US$ in 2005. Figure 2.2 shows sector-wise PPP investment scenarios in the developing economies: the energy and telecom sectors were dominant until recently, when the transport sector also began attracting more PPP investments. The energy sector accounts for more project counts but with a lower amount of investment values; the telecom and transport sectors include mega projects with large investment (World Bank PPI Database, 2018).

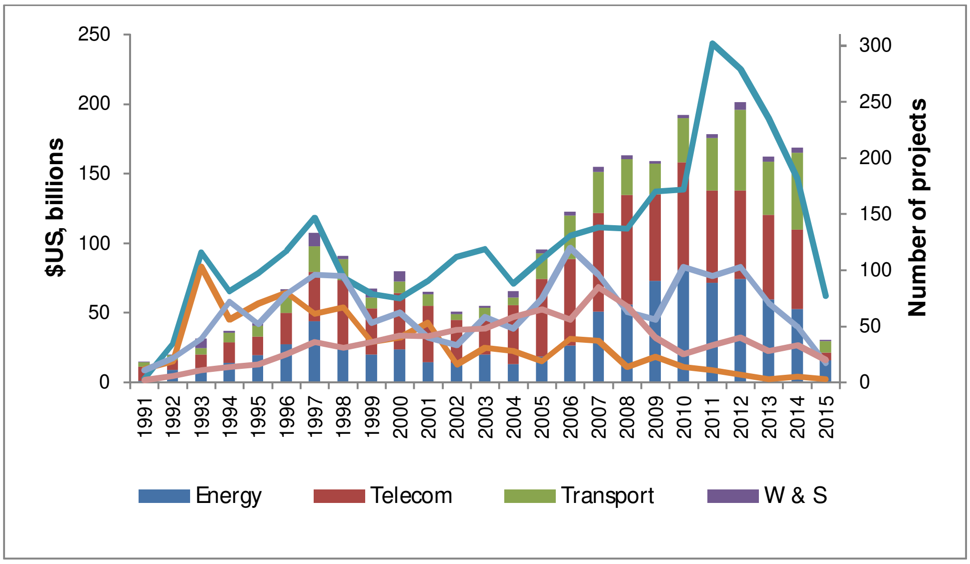
Figure 2. 1: PPP investment in four sectors in the developing world by six regions



Notes: EAP: East Asia and Pacific; ECA: Europe and Central Asia; LAC: Latin America and the Caribbean, MENA: Middle East and North Africa, SA: South Asia, SSA: Sub-Saharan Africa.

Source: World Bank PPI databases (2018).

Figure 2. 2: PPP investment in developing economies by four sectors



Note: W & S: Water and sanitation.
Source: World Bank PPI databases, 2018.

Public sector debt and the microeconomic environment

The developing countries (upper-middle-income and lower-middle-income countries) prefer the PPP option to materialise their advantages. These advantages can be better realised in a context where governments suffer heavily from debt burdens and the aggregate demand and market size are greater. PPP options also become effective in countries that have previous PPP experiences, better macroeconomic stability, and relatively better marketability of the services (Hammami et al., 2006; Yang, Hou, & Wang, 2013). However, developing countries often underperform, due to their poor regulatory qualities, their weaker financial market, their unstable macroeconomic factors, and their lack of political commitment (Sanghi, Sundakov, & Hankinson, 2007). Private investors in India, for example, who mostly took loans from state-owned banks, are under pressure of interest obligations. Infrastructure indebtedness has risen and non-performing assets have grown up in the banking sectors because of the credit expansion (World Bank, 2014b).

Corruption and moral hazard

PPP performances differ with respect to industry-specific variations, depending on the nature of the infrastructure under development, the type of technology required, and how capital intensive the project is (Hammami et al., 2006). Corruption in PPPs, as revealed in Latin American developing countries (Guasch, Laffont, & Straub, 2007), in China (De Jong et al., 2010), and in Eastern European developing countries, has created moral hazard problems for governments. Governments have provided implicit or explicit guarantees that encourage contract renegotiation in anticipation of a bail-out program to be offered to the contractors by the government (Engel, Fischer, & Galetovic, 2014b). This problem might create contingent liabilities for future governments (Percoco, 2014).

The political environment, opportunity cost and accounting system in PPPs

Private sector participation in PPP ventures in developing countries has a significant link to the political environment that can support the reduction of costs and risks associated with PPP investment. In particular, the activities of opposition parties are associated with building confidence in private investors (Moszoro, Araya, Ruiz Nunez,

& Schwartz, 2014). Furthermore, the conceptual difficulties of the opportunity cost of the public funds, and the accounting tricks used in government accounting, might lead to a misunderstanding of the worthiness of PPPs (Trebilcock & Rosenstock, 2015). For example, a case of an opportunity cost may happen in user-fee-based projects, where the state forgoes the future revenue streams and provides contractors with controlling and supervising authorities to extract the revenues from the projects (Daniels & Trebilcock, 1996). An accounting trick may apply in masking government long-term liabilities, when the government pays the contractors for the facilities over the life of the project, in the case of non-user fee-based PPPs (OECD, 2008).

2.5 PPP performance evaluation practices in developing country context

The literature on PPP performance mechanisms experienced across different jurisdictions of PPPs has been comprehensively reviewed. This review is presented in list form in table (see table 2.1, section 2.4.2).

A little research has so far been accomplished in the developing country context. Those studies represented in table 2.1 depict some country focus, but it mostly relates to the countries in which the survey was directed. A few studies (Almarri & Boussabaine, 2017; Atmo, Duffield, Zhang, & Wilson, 2017; Yuan, Li Wei, Zheng Xiaodan, & Skibniewski, 2018) relate to the developing countries, including China, Indonesia, and UAE, but those studies do not focus on our subject, the performance evaluation mechanism. For example, Atmo et al. (2017) and Almarri & Boussabaine (2017) made a comparative study between two countries on the aspects other than PPP performance measurement approaches. Yuan et al., (2018) developed a model of a performance evaluation framework for measuring the operation performance (OP) of public housing delivery in China. All the other studies have either a global perspective or a developed country context.

Clearly, the outcomes of the review of PPP performance evaluation approaches indicate that few publications report actual PPP performances and their measurement approaches, either as research outcomes or as disclosed information (reports). Any research attempted up until now was in the context of developed countries. However, PPPs in developing countries has materialised through following the models and practices implemented in the developed countries. Sometimes donor agencies (including World Bank, IMF, and ADB) prescribe the use of PPP models in the developing counties, if funding is provided by them. Such prescription holds features of the commonly practiced models of PPPs implemented in developed countries; their performance evaluation mechanisms are automatically transferred to the implementation process in developing countries.

Some studies document performance measurement practices in developing countries (Marin, 2009; World Bank, 2017b, 2017d). In these studies, it is evident that performance is measured based on the coverage of infrastructures built on a PPP basis, as well as their service quality, operational efficiency and level of prices charged for the services (Marin, 2009). The procuring authority gathers information from operators on performance indicators (as specified in the contract document) to be considered responsible for measuring performances (World Bank, 2017b). In India, the Philippines, and South Africa, output-based specifications are used as articulated in the contract document (World Bank, 2017d).

Comprehensive evaluation mechanisms are absent even in such developed countries as Australia and the UK. Their approaches to performance evaluation have concentrated mostly on discussing the advantages and disadvantages of PPPs (J. Liu, Love, Sing, Smith, & Matthews, 2017). A lack of stakeholder-specific and incomplete performance mechanisms exists, even in the developed countries (Hodge & Greve, 2017).

Given these circumstances, an assumption might be made that a PPP performance evaluation system holds features and practices common to both developed and developing countries, except where a specific country develops its own comprehensive evaluation mechanisms that include individual project features and local elements of operating conditions.

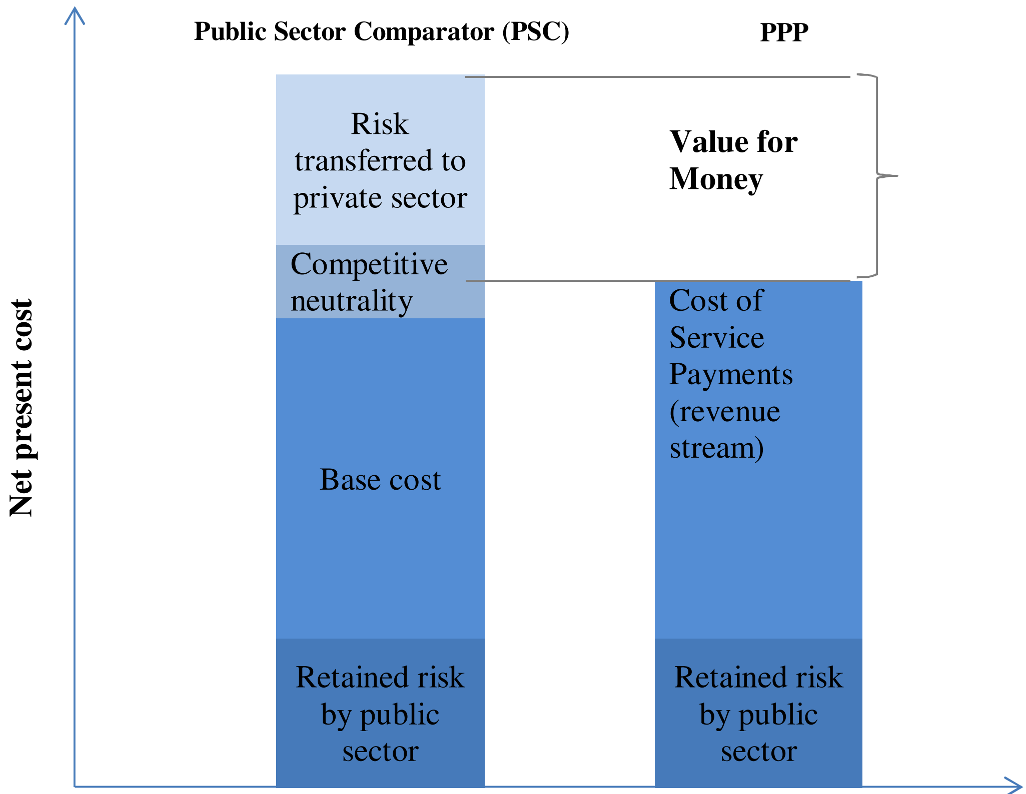
The following sections include detailed discussion of the PPP performance measurement literature that focuses on the public sector comparator (PSC) approach, the key performance indicator (KPI) system, the life cycle approach, the output specification, and the organisational performance evaluation. The PSC approach is a baseline scenario used for comparing the PPP option with traditional procurement, where the risk adjusted cost of the PPP option is considered (World Bank, 2017d). The value for money (VFM) from adopting the PPP option is assessed using this approach.

The key performance indicator system focuses mainly on project level performances, with various indicators used to measure actual performances (Haponava & Al-Jibouri, 2012). This system has recently been extended to the life cycle approach, which accounts for the different process factors that appear in the project life (J. Liu, Love, Davis, et al., 2015; Love et al., 2015). Output specifications specify which outputs are required from the project; they are an essential part of the contract document that governs the procurement and monitoring of PPP projects (Lam & Javed, 2015; Yescombe, 2007).

2.5.1 Public sector comparator (PSC) approach

In the PSC approach, it is important to use the same assumptions as used for PPPs, with respect to timing, funding, output specification and performance standards (Grimsey & Lewis, 2005). After an actual bid, PSC might be compared with the actual to conclude whether the proposed PPP bid promises better VFM (Kweun, 2018). The primary elements of PSC include the base costs, the transferrable risk, the retained risk and the competitive neutrality (Grimsey & Lewis, 2005). Base costs include the capital, operation, and maintenance costs, the overhead costs, as well as any revenue from the project. Transferable risk denotes risks that the public sector entity wants to transfer to the private sector; retained risk refers to risks that remain within the public sector. Hence, the retained risk remains identical in both the PPP and the traditional procurement options (Kweun, 2018). Competitive neutrality means the competitive advantages or disadvantages that are available to the public sector entity, but are inaccessible to the private party (Morallos & Amekudzi, 2008). Figure 2.3 presents a comparative picture between the PSC and PPP approach.

Figure 2. 3: Comparative picture between PSC and PPP approach



Source: Grimsey & Lewis, 2005; Kweun, 2017; Morallos & Amekudzi, 2008.

Achieving value for money (VFM)

A fundamental objective of implementing PPPs is to achieve value for money (VFM): that is, achieving an optimal combination of costs incurred in and benefits realized from a delivery of public services. An analysis of VFM is performed, based on some qualitative parameters (rationale, the scope of private financing and on-site conditions) and some quantitative aspects (fiscal cost), to signal the viability of a PPP project to the decision makers (Kweun, 2018). Furthermore, the best price for a given quantity and standard of output, measured in terms of relative financial benefit, can also be regarded as VFM (Grimsey & Lewis, 2005). The VFM analysis is typically used during an ex-ante assessment of the project: it is very rare in an ex-post evaluation in the current operational practice (Shaoul, Stafford, & Stapleton, 2006).

VFM assessment practice in developing countries

Although the construction and application of a PSC is an innate part of all PPPs in the UK and Australia, and is active in some other regions of the world, many countries do not use a PSC approach in assessing VFM. It even happens in developed countries such as the USA and France. In the USA, the VFM is sought through the tendering process; in France, a concession model is used to determine it (Grimsey & Lewis, 2005). However, some developing countries, including South Africa, use a PSC calculation for VFM assessment; Argentina uses a competitive bidding process to gauge this value. India, which applies a PPP option for producing power, building road infrastructures, and procuring hospital and water and sanitation services, uses a cost estimate for assessing VFM, rather than using the PSC systematically. If actual bids come to the level that is substantially different to the estimates, further analysis is done to justify the actual bids. The Philippines uses a best-practice approach that includes different structures of PPPs, such as build-operate-transfer (BOT), build-own-operate (BOO), build-transfer-operate (BTO), and build-lease-transfer (BLT). Water supply and sanitation projects in east and west Manila are two examples of a ‘best practice’ approach in delivering water services. VFM recorded by the winning bidder, to provide water supplies at a lower price, was compared to the water services by the traditional approach (Grimsey & Lewis, 2005). In Bangladesh, no formal PSC tool has been used until now, but, through competitive tendering, the VFM is realised by awarding the project to the highest bidders. Both the technical and the financial proposals are considered in selecting competent bidders (PPP Authority, 2016).

Criticism of PSC

PSC-based value for money appraisal has also been criticised. A recent development in the VFM analysis literature claims that VFM analysis should include four general categories: social welfare analysis, non-financial benefits and cost to public sector agencies, local governments, and users and non-users of the project (DeCorla-Souza, Ham, & Timothy, 2016). DeCorla-Souza et al. (2016) also recommended that the benefit-cost analysis (BCA) could supplement the VFM analysis by contributing to a greater transparency and accountability in the PPP procurement process.

The VFM appraisal system, which is biased in favour of policy expansion, is constrained by the unavailability of information needed for evaluating performances (Shaoul et al., 2006). The UK Public Accounts Committee criticised the PSC process as a ‘manipulation’ (Hodge & Greve, 2017); other researchers (Ball, Heafey, & King, 2007) have argued that the VFM analysis is a subjective analysis of risks associated with a project. Risk transfer to a private party is subject to the assumptions made for a) the amount of risk to be transferred and b) the calculation of value for the transferred risk. A change in the hypothetical assumptions regarding risk can change the NPV calculation. In addition to those risks transferred to the private sector, other risks, such as obsolescence, changing needs and service performance outcomes, are retained by the public sector, which indirectly costs the public. Further, with contracts that last longer, such as 20 to 50 years, the financial evaluation of the cost and transferred risk might be incomplete, where non-financial matters and long-run consequences need to be taken care of (Grimsey & Lewis, 2005; Morallos & Amekudzi, 2008).

2.5.2 (Key) Performance indicator system

The concept of using an indicator system for evaluating performances, which originated from the theory of benchmarking, and which is currently used in many industries, has the objectives of improving business activities and setting higher targets. Indicators are generally used to compare actual achievements with the targets (Haponava & Al-Jibouri, 2009, 2012). The performance indicator system is widely used in construction projects; measurement previously focused mainly on the project level, but recently widened its scope to the process or life cycle of the project (Haponava & Al-Jibouri, 2012). KPIs include a) efficiency measures (e.g., inputs and outputs); b) effectiveness in terms of outcomes (e.g., the quantity and the volume of access); c) service quality measures; d) financial performance measures; and e) process and activity measures. These KPIs are commonly used in both developed and developing countries, with little variations in their application (OECD, 2008).

KPI system adopted in PPPs

The KPI system has been adopted into PPPs from the project management area, along with their embedded features: cost, time and quality (the iron triangle) are the principal indicators in measuring project performances (J. Liu, Love, Smith, Regan, & Sutrisna, 2014). However, PPPs differ from traditional projects with respect to a) stakeholder interest, b) the different purposes of the project (also include political purposes), the unique procurement approach, and the complex project features (J. Liu et al., 2017; Yuan, Wang, Skibniewski, & Li Qiming, 2012). Performance indicators of PPPs might even change with changing conditions of the operating environment and the project features. Further, the measurement approach evolves from the traditional one towards a more comprehensive evaluation technique that can capture the interest of multi-stakeholders.

Summary of the studies on KPIs

Previous studies (Lawther & Martin, 2014; J. Liu, Love, Smith, Matthews, & Sing, 2016; Mladenovic, Vajdic, Wündsch, & Temeljotov-Salaj, 2013; Osei-Kyei & Chan, 2017a; Saeed, Duffield, & Hui Felix Kin, 2018; Yuan et al., 2018; Yuan, Zeng, Skibniewski, & Li, 2009; Zhou, Keivani, & Kurul, 2013) presented different models of the performance framework/indicator system for PPPs. A complete list of reviewed literature with the main features of the studies has been enumerated in table 2.1. Most of these studies have either focused on developed countries or used a global perspective. Three studies (Yuan et al., 2018; Yuan, Skibniewski, Li Qiming, & Zheng Lei, 2010; Yuan, Wang, et al., 2012) have focused on China, a particular country that has different characteristics of governance and economy from other developing countries. Only the study of Osei-Kyei & Chan, 2017a has a developing country focus, especially on Ghana. But the authors mentioned that the conclusion drawn in this study should not be generalised for all developing countries. However, in the following paragraphs, a detailed discussion on the notable studies of performance indicators system has been made.

Table 2. 1: Summary of previous studies of performance measurement of PPPs

Authors	Focus country/ Territory/sector	Method (Sample/case/analysis etc.)	Comments/conclusion	Future direction
(Yuan et al., 2018)	China; Social infrastructure (housing)	Stratified random: Questionnaire survey of 124 respondents in China; Cronba Alfa, CFA analysis, Path analysis	• A model of indicator system for operation performance (OP) of public housing in China • Housing allocation and recycling efficiency, project spatial distribution, living environment, and financial status of the project significantly contributed to the OP of public rental housing (PRH) • Proposed improvement paths	Detailed evaluation criteria for OP indicators
(Osei-Kyei & Chan, 2018)	Global; Sector not specific	International survey of 42 respondents, mostly from developed countries; Kendall's Concordance, quartile grouping, Kruskall-Wallis and Mann Whitney U Test	• Success criteria for PPPs differs among stakeholders (public, private and academics) • Effective risk management, meeting output specifications and satisfying the needs for public facility are leading success criteria, with some differing degree of significance	Incorporating general public in specific country or region
(Saeed et al., 2018)	Australia & UK; Social infrastructure (school)	Archival case study; Qualitative analysis	• Ex-post performance measurement framework for schools in Australia • Performance measurement should focus on process and outcomes instead of inputs and outputs	Key stakeholder opinions would be important to validate this findings
(Osei-Kyei & Chan, 2017a)	Ghana (developing countries focus); Sector not specific	Questionnaire survey in Ghana (77 respondents) Fuzzy synthetic evaluation	• Developed a project success index for developing countries • Three major success criteria are: local development and disputes reduction, profit, cost, and technical specifications	Not to be generalised for all developing countries
(Willems et al., 2017)	Belgium; Sector not specific	Open-end questions (100 respondents); Qualitative analysis	• Value for money evaluations need to be broadened • Ten lessons have been leant in ten years' experience	---
(J. Liu et al., 2017)	Australia; Social infrastructure	Open-end questions (135 respondents); CFA analysis with mean scores	• Empirically tested life cycle performance measurement framework (PMF) that comprised 5 perspectives and 60 core indicators for social infrastructure in Australia	Model can be tested in economic infrastructures as well
(Osei-Kyei, Chan, Javed, & Ameyaw, 2017)	Global; Sector not specific	Questionnaire survey (42 respondents globally), but most of them are from developed countries; Cronba's Alfa, Kendall's and Summary statistics	• Identified 15 project success criteria, of which seven are highly critical, including effective risk management; meeting output specifications; reliable and quality service operations; adherence to time; satisfying the need for facility/service; long-term relationship and partnership; and profitability	Country or region-specific in-depth study can be conducted
(Almarri & Boussabaine, 2017)	UK and UAE	Questionnaire survey in UK (62 respondents) and UAE (30); Regression analysis with scores (CSFs are independent variables and cost, time quality etc. are dependent variables)	• Have found association between critical success factors (CSFs) and PPP project performance • Project technical feasibility, social support and local financial market assessment, cost/benefits assessment, appropriate risk, are the CSFs that have association with cost, time, quality, service and profit performances in varying degrees	Lack of generality

			• Cost and quality were the least/minimal performance criteria that could be predicted by the factors	
(Atmo et al., 2017)	Indonesia	56 power projects (cost, time and quality data); Two-way ANOVA, graphs and other quantitative analysis	• Compared outcomes of PPP power projects with traditional ones • PPPs have superior time and operating availability (quality) performance than traditional ones while no differences are in cost performance • Suggested for selection of experienced providers and enabling policies to attract international operator to come forward	Could be extended to a regional focus
(Hodge & Greve, 2017)	Global, but focused on developed countries	Review of the archival literature on PPP performance and beyond; Qualitative analysis	• P3 has meanings in five levels: project, delivery method, policy, governance tool and cultural context • Judging success depends on who it is for • P3 will remain a successful option for political leaders with flexibility in usage	Hinted on necessity of stakeholder-specific and appropriate performance evaluation mechanism
(Klijn & Koppenjan, 2016)	Netherlands; Sector not specific	Questionnaire survey (144 respondents from 68 PPP projects); Multi-level regression analysis	• Investigated impact of contract features including possible sanctions, contract complexity, flexibility and scope of renegotiation on performances • Found only sanction possibility has impact on performances • Need to look beyond contract terms to properly understand and manage PPP performances	Suggested for more evidences
(J. Liu et al., 2016)	Australia; Social infrastructure (hospital, prison and school)	Interviews (25 in Australia); Qualitative analysis (Nvivo Software)	• A process based or life cycle performance measurement framework has been proposed in place of traditional one, where a series of performance indicators will be used to measure performances • Have strategic focus on value for money	Suggested for case study and CFA to validate these findings
(Love et al., 2015)	Global, focused on developed countries; Sector not specific	Review of literature on PPP performance evaluation	• Life-cycle approach to project evaluation is needed • Application of building information modelling (BIM) in PPP project process evaluation can result in PPPs to be 'future proofed' and management of assets over the whole life to be successful	Further testing and application of BIM approach in PPP process evaluation
(J. Liu, Love, Carey, Smith, & Regan, 2015)	Australia; Infrastructure overall	Literature review; Vector Error Correction Model/Unit root test/Co-integration test/Variance decomposition	• Developed a set of KPIs for ex-ante evaluation of macroeconomic environment for PPPs and found critical to such evaluation using Granger causality test • Conditions of global economy is essential KPI for ex-ante PPP environment evaluation • Construction price level, domestic economic conditions, money market conditions, and unemployment level are the most critical KPIs in the ex-ante evaluations of PPP infrastructure projects.	Selecting of a suitable option between PPP and traditional procurement might be a future agenda
(J. Liu, Love, Davis, et al., 2015)	Global; Sector not specific	Literature review; Conceptual model	• Based on five measurements facets of performance prism, a conceptual model of life cycle performance measurement framework has been proposed for PPP project evaluation	Mentioning case study to be conducted to validate the model

(Liyanage & Villalba-Romero, 2015)	UK, Spain, Portugal and Greece; Transport sector	Case study; Qualitative Comparative Analysis (QCA)	• Developed a methodology of measuring the success of PPPs, encompassing three perspectives including management, stakeholders and contract perspectives • Perception of success may change if perspectives change	Attaching weights to the KPIs/using different perspectives and mores cases to see if what results come out
(Lam & Javed, 2015)	Australia & UK	Questionnaire survey (131 from UK) and 62 (Australia); Cronbach's Alfa; Kendall's concordance; Mann Whitney Test	• Comparative study shows that pitfall issues and change management issues are • Common pitfalls include conflicts between input and output specifications • Performance standards are compromised with affordability, • Small changes are often made by the public sector authorities • Changes are dealt with by anticipatory provisions in output specifications, or negotiations as and when they arise	----
(Javed, Lam, & Chan, 2014)	Global; Sector not specific	Experimental approach based on Game theory, conducted in university students	• A detailed and clear output specification with cost-sharing framework facilitates change negotiation in PPPs	More research-based game theory to confirm these findings
(Lawther & Martin, 2014)	Australia & Canada; Transport sector	Case study; Two cases from Australia and Canada	• KPI system is inappropriate to measure the performances from the perspectives of agency, societal or project goals • Inappropriate choice of KPIs and standards	----
(Zhou et al., 2013)	UK; PFI projects	Literature review for identifying indicators; Questionnaire survey (65 respondents); Kruskal-Wallis test	• KPIs and benchmarking are developed for measuring sustainability performance of the PFI projects. Environmental, economic, social and technical aspects have been considered. • Important KPIs are care of end-users, whole life costing, health and safety, capital cost, energy consumption during operation and low maintenance cost	In-depth qualitative analysis is demanding
(Mladenovic et al., 2013)	Global; Transport sector mainly	Brainstorming outcomes are refined by literature support and then expert surveys; 18 experts participated; Frequency of mention approach	• KPIs are classified into three groups: Technical, operational and financial KPIs • Two layers approach has been developed: first, objective based project evaluation from stakeholders' perspectives. Objectives include profitability (private sector), effectiveness and value for money (public) and level of service (users). Second, an adjusted and weighted combination of fulfilment of the specific stakeholder objectives will lead to an overall approach of describing a PPPs success or failure. • A large number of KPIs are common among the public and private partners, implying that private partners are aware of the objectives of PPPs and are committed to provide better public services.	Identifying appropriate CSFs and KPIs might be interesting research agenda
(Oyedele, 2013)	UK; PFI projects	Focus group discussion; Questionnaire survey (87 respondents); Cronbach's alfa/Multiple regression/spearman correlation	• Developed a predictor model comprising seven CSFs, which would help contractors avoid performance failure payment deduction and thus help to maximise profits of the sponsors • Seven CFSs are good working relationship, minimal use of subjective measures, a functioning help desk, realistic performance standards,	The study was limited to UK industry; other countries might be the focus of future research with similar approach

			quality of service delivery, use of just in time (JIT) inventory system and contractor's active participation in design process.	
(Javed, Lam, & Zou, 2013)	Australia	Semi-structured interviews (19 experts from across Australia); Qualitative analysis (Triangulation of interviews)	• A good set of output specifications is conducive to the achievement of value for money, innovation, risk transfer, whole life asset performance • Too many and complex KPIs were specified in Australia PPPs, which are difficult to monitor and implement while very prescriptive specifications hindered innovations and did not allow appropriate risk allocation • A careful drafting of output specifications can mitigate these challenges	This result learnt from fail-projects should be further investigated
(Yuan, Wang, et al., 2012)	Global, but focused on China	Questionnaire survey (141 respondents based on stratified random sampling); CFA analysis	• A conceptual model of KPIs developed by the same authors is empirically tested by using CFA and an improved model of 41 performance indicators has been developed • Performance improvements within PPPs are strongly influenced by reasonable procurement, design and planning in the public sector, effective process control in the private sector, and the ultimate satisfaction of both the public and private sectors	Cause and effect relationship between performance packages, PIs and project performance should be clarified by future research
(Raisbeck et al., 2010)	Australia; Infrastructures overall	Project data (21 PPP and 33 traditional projects selected from across Australia);	• PPP provided superior performances in cost and time dimensions over traditional procurements and PPP advantages increase with the size and complexity of projects	Common techniques need to be developed for measuring PPPs performance across the globe
(Yuan et al., 2010)	Global, focused on China; Social infrastructure (Beijing Olympic)	Questionnaire survey (141 respondents based on stratified random sampling); Fuzzy entropy method and fuzzy TOPSIS method	• A group decision weight of 15 performance objectives has been derived by using fuzzy entropy method, where different stakeholder decision is reflected • Selecting appropriate performance objective levels for PPP projects	Quantitative assessment (weight) of performance objectives and finding model of reduced number of indicators
(Yuan et al., 2009)	Global; Stakeholders perspective, sectors not specific	Literature review and goal setting theory for identifying objectives; Questionnaire survey (141 respondents based on stratified random sampling); Cronbach's alfa/Mann-Whitney test/ANOVA	• 15 performance objectives are identified from the literature reviews and all of them are important objectives though stakeholder groups differ on public sector budget constraint, risk, revenues and guarantees. However, they have similar opinions on cost time and quality etc. • A conceptual model of process factors those are static and dynamic. These factors influence performance of PPPs	A call for developing relative importance of objectives by using mathematical model; Application of improved and more objective method to get rid of fuzziness bias
(Hodge & Greve, 2007)	Global, but Australia focused	Literature reviews; Qualitative analysis	• Have both success and failure experiences, with some glowing policy promises • Mixed results of PPP effectiveness	Need to strengthen evaluation mechanism and free assessment from political bias

Source: Author

A critical review of related literature

J. Liu et al. (2015) developed a set of KPIs for ex-ante evaluation of the macroeconomic environment for PPPs and found them critical to such evaluation. The most critical ones are the construction price level, the domestic economic conditions, the money market conditions, and the unemployment level. J. Liu et al. (2016) subsequently proposed a process-based or life-cycle performance measurement framework in place of the traditional one. In this study, a series of performance indicators have been proposed to be used for focusing on the VFM measurement. Both of these studies are based on Australia, with implications for other countries.

Yuan et al., (2009) developed a performance objectives model that comprises five performance packages: project quality, financial and marketing, innovation and learning, stakeholders, and process indicators. Using a Likert scale survey among different stakeholders from around the globe, Yuan et al. (2012) then derived an estimate of the relative importance of the indicators; however, the operating context of the PPP project was ignored. For example, better transparency and accountability for executing a PPP project in an advanced country can cause project performance to vary more widely than that of a relatively poor operating environment in a developing country. Accordingly, the results found in such a study cannot be used for generalising a performance framework applicable to a specific group of countries, such as developing countries. In the context of some European countries, the ‘overall’ success of transport PPPs was measured by using a qualitative approach (Liyanage & Villalba-Romero, 2015).

Yuan et al., (2018) proposed a model of an indicator system for improving operation performance (OP) and performance improvement pathways for public rental housing (PRH) in China. The OP, which includes 23 indicators, consists of four packages, housing allocation and recycling efficiency, project spatial distribution, living environment, and financial status of the project; it has significantly contributed to the OP of PRH (Yuan et al., 2018).

From an international survey, Osei-Kyei et al. (2017) identified a set of 15 project success criteria that included effective risk management, meeting output specifications, reliable and quality service operations, adherence to time, satisfying the need for public service, long-term relationship and partnership, and profitability. Most of the experts in the survey were from developed countries; the criteria reported were very generic, but were not sector or stakeholder specific. Success criteria for PPPs differ in different sectors and even among stakeholders (e.g., private, public and academic) (Osei-Kyei et al., 2017). Using the same survey results, Osei-Kyei & Chan (2018) recognized three leading PPP success criteria: effective risk management, meeting output specifications and satisfying needs for public facilities. For PPPs in developing countries, a project success index, based on ex-ante critical success factors, was developed (Osei-Kyei & Chan, 2017a) using a country-specific (Ghana) Likert scale survey. This result should not be generalised for other developing countries, but might be used as a reference for future research.

For measuring the sustainability of PFI building and other infrastructure projects, Zhou et al. 2013 developed a framework of KPIs with 28 sustainability indicators grouped into four dimensions: environmental, economic, social and technical. The most important indicators among them are whole-life costing health and safety, capital cost, energy consumption during operation and low maintenance cost. Their study is limited by the sampling bias caused by the geographic location, based on England and Wales, and the application of a quantitative approach. For monitoring the performance of transport PPPs, Mladenovic et al. (2013) introduced a two-layer approach for evaluating PPP projects. First to be performed is an evaluation of the project objectives that includes profitability (private sector), effectiveness and value for money (public) and level of service (users) from the perspectives of different stakeholders. Second is an adjusted combination of fulfilling the objectives of a specific stakeholder group, leading to an overall approach of telling the success or failure of a PPP project. KPIs are classified into three groups: technical, operational and financial KPIs. A large number of these KPIs are common among the public and private partners. This implies that private partners are aware of the objectives of PPPs and are committed to providing better public services (Mladenovic et al., 2013).

Criticism of the KPI system

Several criticisms are made about using the KPI system. KPIs used in PPPs are product-based, as the traditional performance evaluation techniques are (Regan et al., 2011); accordingly, they are inadequate for measuring agency or social objectives (J. Liu, Love, Carey, et al., 2015; Yuan et al., 2018). Selecting indicators and setting standards to measure performance are critical to the success of the KPI system. Performance measures and standards change over time and need to be adjusted, because initial standards may have been too low, and because goals of the projects may evolve over its life. For example, raising standards might be favoured by public partners but opposed by private partners if additional resources are required for meeting higher standards (Lawther & Martin, 2014).

2.5.3 Lifecycle evaluation approach: A critical review

Unlike traditional procurements, PPPs follow a dynamic process that takes place over the life of the projects. To arrest the dynamic issues, a lifecycle approach that can be considered as an extension to the KPI system is needed to better evaluate the PPPs performance. Each phase in the cycle should have a number of performance indicators, depending on the project characteristics and the local elements of the operating context, where the projects being implemented (Love et al., 2015). During this life cycle, static and dynamic factors that appear in the process can be used to track the performance of the project and are important for allowing public and private partners to make appropriate decisions to improve value for money efforts. But a level of sophistication in the knowledge of macro, micro, financial and political conditions is required for proper understanding of these performance indicators for both of the public and private sectors (Yuan et al., 2009).

Other researchers (European Investment Bank, 2011; J. Liu, Love, Davis, et al., 2015) have proposed a process-based performance framework instead of a KPI-based static (ex-post and ex-ante) review mechanism for evaluating project performances. Advocates of this system claimed that evaluating PPPs requires many components, that including documentation, financing, and taxation, should be considered in the process (J. Liu, Love, Davis, et al., 2015). Market and business risks may arise from the complexity of long-term contract arrangements and may change over the project life (Raisbeck et al., 2010). The following studies have proposed and discussed a lifecycle-based performance measurement framework in the context of a theoretical perspective, even though its application is yet far from fruition in both developed and developing countries.

J. Liu, Love, Davis, et al. (2015) has proposed a dynamic life-cycle performance measurement framework that consists of a set of phase-based core indicators into five perspectives of the performance prism. Core indicators are expected to capture the dynamic factors that appear in each project phase, giving public and private sector manager better insight into a comprehensive evaluation of PPPs. Using this model, practitioners can monitor and improve performance while the project is still ongoing (J. Liu, Love, Davis, et al., 2015). J. Liu et al. (2017) later empirically tested this conceptual model and found that all measurement perspectives (facets) and core indicators except four are significantly correlated to the PPP performance. This model will allow performance evaluation even during the inception phase of a PPP, by evaluating stakeholders' satisfaction level along with their contribution to the project (J. Liu et al., 2017).

A life cycle approach with a building information modelling (BIM) was developed to enable the shortcomings of the PSC to be addressed visually and in a dynamic manner. It will provide with real-time information to monitor performance, which will ensure that VFM is being achieved. BIM is expected to improve a coordination and integration between special purpose vehicle, end-users, and the public sector and deliver a digital representation of physical assets and their functional features that would facilitate an informed decision making across a project lifecycle (Love et al., 2015). Love et al. (2015) divided the process of a PPP project into three phases: initiation and planning, procurement and partnerships. However, the process in practice includes more aspects than this—such as financing, transparency and accountability, as well as stakeholders' satisfaction and socio-economic development.

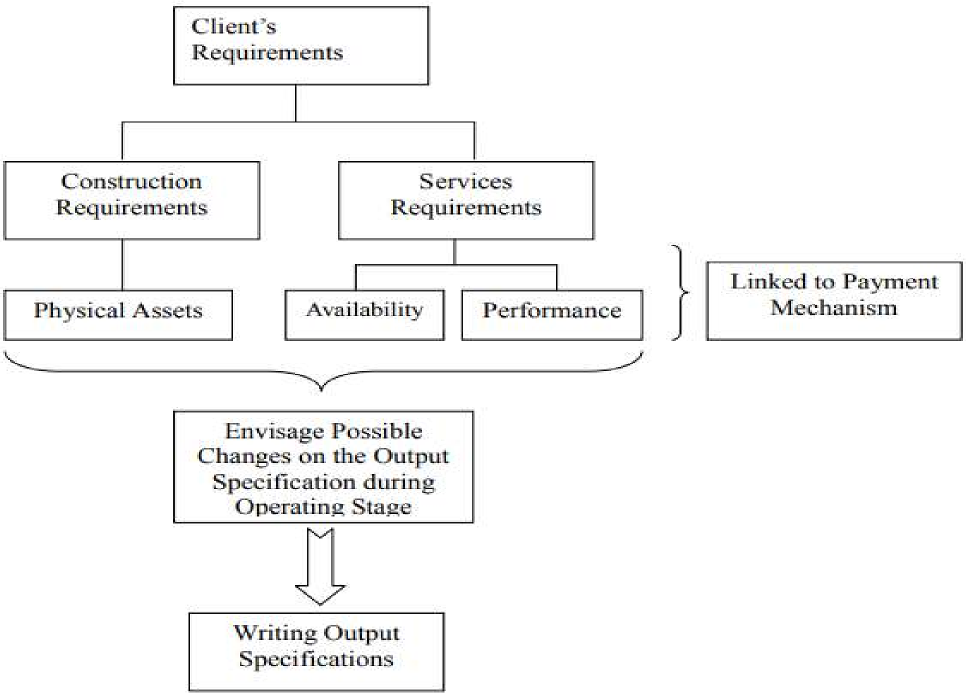
2.5.4 Output specification approach

Along with many aspects (including purpose and scope of the PPP projects, performance requirements, compliance standards, risk allocation), the output specifications specify which outputs are required from the projects, but not how these outputs will be achieved (Javed, 2013; Yescombe, 2007). Output specification is integral to the contract document of PPPs, which specify and guide the procurement and monitoring PPP project over its lifecycle (Lam & Javed, 2015). Procuring agencies define the technical and operational requirements of the facilities and use this approach for the outputs to be achieved, leaving opportunities for private operators to apply their expertise in the design, construction and operation of the facilities (Javed, 2013). Output specification also relates other elements such as payment and change mechanisms. In the payment mechanism, the availability payments are made, subject to the fulfilment of the output specifications, while the rectifications and changes in different performance measures and indicators are linked to the change mechanism (Javed et al., 2014). Minimum required performances are the pre-requisites for the payment to be made to the contractors. Failure to ensure a certain level of performances, as specified in the output specifications, results in a deduction of payments (Oyedele, 2013). Output specifications are also used to monitor the standard of services over the life of the projects. This differs from the traditional technical specifications, on the grounds that traditional specifications prescribe the materials and labour required for the services and for the way the services will be delivered. In contrast, output specifications in the case of PPPs are what the services' constructed infrastructures deliver and the levels of operation of the facilities. Output specifications are thus set in a configuration with users' needs (Javed, 2013; Oyedele, 2013). A process flow for writing output specifications is presented in figure 2.4.

Pitfalls of output specifications

While output specifications serve a great purpose in measuring and monitoring performances of the PPP projects, some pitfalls exist in this approach. Performance evaluation using this mechanism seems ambiguous, excessively complex and difficult to manage. Failure to define and follow the service requirements precisely leads to substandard outcomes. Sources of pitfalls relate to a lack of completeness and clarity. As with the traditional technical specifications, the input transparency of PPPs is relatively high compared to output transparency. Unclear guidelines of procuring agencies leave room for the private sector to behave strategically, avoiding the requirements of the output specifications. Again, multi-interpretable output specifications provide scope for the agencies to avoid performance requirements. Setting output specifications requires a high level of related experience and knowledge, precisely for the procuring agencies even in most of the advanced countries (Javed et al., 2013; Lam & Javed, 2015).

Figure 2. 4: Process flow of writing output specifications



Source: Lam, Chan, & Chan, 2010.

The in-built complex features of output specifications allow only developed countries such as the UK, Australia, and Canada to apply this mechanism in evaluating and monitoring PPP performances. Although the output specifications appear in contract documents, even in the case of a developing country context, this approach is rare in practice. Existing literature on output specification in PPP performance evaluation provides little evidence of any application of output specification mechanism in the developing countries, except for some upper-level developing countries such as South Africa and Malaysia. A clear and transparent output specification can contribute to the reduction of conflict between partners and can achieve better goals for the PPPs.

2.5.5 Organisational level performance evaluation

Discussion in the previous sections has focused on different performance evaluation mechanisms related to project level performance. This section covers the review of organisational level performance literature from the broader perspective of developed and developing countries because of the unavailability of related literature specific to the developing countries. Organisational level performance differs from project level performance with respect to the different factors used to evaluate their performances. Project level performance generally helps to attain organisational performance (Elwakil, 2017).

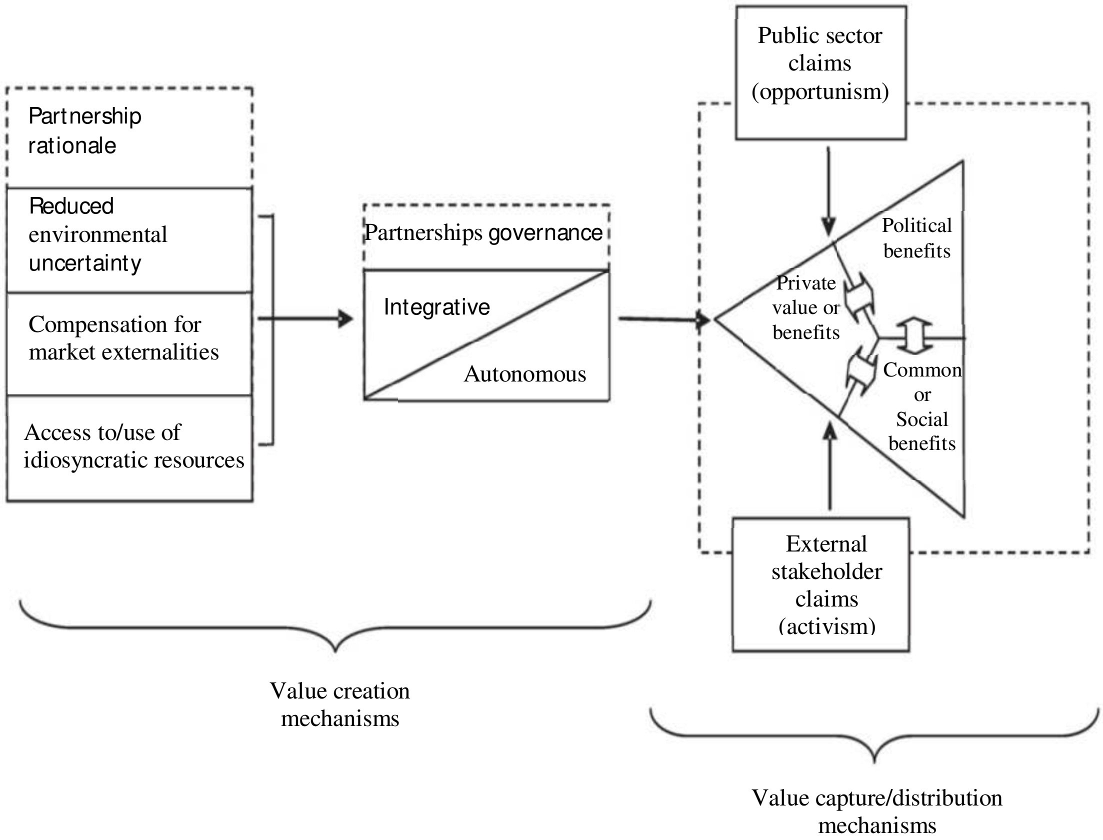
Although a considerable amount of attention and resources has been devoted to PPPs, no conclusive evidence has been found to show that PPPs have so far truly demonstrated notable organizational performance. The lack of transparency in PPP financial reporting and irregular updates to PPP information are critical findings (Homkes, 2011). Nonetheless, evidence of relatively more accountability was found in the Flemish social PPPs, where actors were more active in the accountability forums and behaved more actively, and their activities resulted in democratic accountability (Willems, 2014). Because PPPs take the organisational form in between the private and public bureaucracies, they require multidisciplinary skills (Hodge & Greve, 2007). Accordingly, their performance evaluation needs to include areas that would focus on policy or goal achievement, democratic norms, transformation or innovation in the public sector, incentives to innovation or connectivity, and coordination and coalition (Jeffares, Sullivan, & Bovaird, 2009).

However, a political context might thwart the designing of such a holistic approach because the political consideration might be different otherwise (Higgins & Huque, 2014). To ensure greater public interest, the concept of ‘less government’ and ‘more governance’ (Osborne, 1993) has appeared to be more useful in public–private collaboration. This concept allows for an innovative form of organisational governance in creating and capturing values of PPPs, where partners have interdependencies for their support and sincerity (Mahoney, McGahan, & Pitelis, 2009).

PPP organizational performances are impacted by conflicts between public and private parties, for example when partners offer shared resources too little and take away too much and when they prefer self-interest to the collective interest of partnership objectives. Increased trust, self-efficacy and social responsibilities might provide a solution to these conflicts (Van Lange, Joireman, Parks, & Van Dijk, 2013). An unclear allocation of the fractionalized property rights would ‘opportunistically’ appropriate financial residuals and asset ownership; other flaws in the property right configuration would create a managerial discord that would tighten the goal achievement and might even lead to an organizational failure (Vining & Weimer, 2016).

A theoretical framework of organisational governance for creating and distributing values of PPPs is presented in figure 2.5. The framework consists of two conceptual PPP governance alternatives, integrated and autonomous. Each of these is attributed to different value-creating capacities, rationales, and social and private outcomes. Given the boundary choices of the governance types, from the integrative to the autonomous form, there are numerous trades-offs regarding which type would be chosen to be implemented. On the value distribution side, both public partner opportunism and stakeholder activism are critical dynamics in producing partnership outcomes (Kivleniece & Quelin, 2012). An appropriate institutional framework is also critical to PPP success, since it provides a basis for proper risk allocation between the parties concerned (Geddes & Wagner, 2013).

Figure 2. 5: Value creation and capture in PPPs: An integrated model



Source: Kivleniece & Quelin, 2012.

2.6 KPAs and performance indicators in developing countries

2.6.1 Clustering performance indicators into KPAs

The use of performance indicators in evaluating PPP performance depends on the types of projects and the operating environment in which the projects are being executed. A broad set of indicators are common in both developed and developing country studies, though some indicators appear in some jurisdictions but not in others, based on the context and project features. Available research has attempted to develop sets of performance indicators using different names such as performance objectives (Yuan, Wang, et al., 2012), performance measures (Liyanage & Villalba-Romero, 2015), KPIs (Mladenovic et al., 2013), and dynamic life cycle performance measurement (J. Liu, Love, Davis, et al., 2015).

Yuan et al. (2012) previously grouped performance indicators into five categories: a) physical characteristics of the projects, b) financial and marketing aspects, c) innovation and learning, d) stakeholders' requirements and e) project implementation. Mladenovic et al. (2013) clustered public sector KPIs based on economic, technical, and operation and maintenance aspects. J. Liu et al. (2015) grouped a set of core indicators in a dynamic life-cycle performance framework into three major phases: initiation and planning, procurement and partnerships. Using the essence of these studies in relation to grouping indicators, we have clustered performance indicators into KPAs, based on the phases of a PPP project in the context of developing countries. Sub-section 3.5.2 provides a definition of the KPAs, based on the existing literature.

2.6.2 Defining KPAs

Planning and Initiation

Planning and initiation refers to a detailed plan and initiative for undertaking a PPP project. This includes service planning, functional design brief, implementation planning, and feasibility assessment. The implementation plan states the size and nature of the risks associated with the project and sets management strategies for handling those risks. In a case of poor planning, private parties may take undue privileges (World Bank, 2017d). To measure the performance of the planning and initiation KPA, the indicators that underlie this measurement in developing countries include needs assessment, SMART objectives, implement-ability assessment, feasibility analysis, and public interest test.

Tendering

Tendering, the process of awarding a contract to the concessionaire, begins with developing an expression of interest and ends with awarding the contract to the winning bidder after exhausting all of the necessary tasks within the tendering phase. PPP tendering practices differ in developed and developing countries (T. Liu, Wang, & Wilkinson, 2016). The important indicators responsible for measuring tendering performances include efficient concessionaire selection, selection criteria and method, fairness and transparency and a standardised contract.

Construction and Operation

Bundling of the design, construction, operation and other tasks in the construction phase depends on the characteristics of the project and the allocation of risk among the parties involved (Iossa & Martimort, 2015). In this study, for the case of the developing countries, an ideal bundling type comprising design, construction, and operation is considered. After finishing construction of the facilities, the operation starts and continues until the end of the project life, which may extend to, for example, 20 to 30 years, unless the contract is renewed or ownership of the assets is transferred. In order for the performance of this area to be assessed, the identified indicators are cost, time, quality, life cycle maintainability, and dispute settlement.

Sustainability of Partnerships

Sustainability of partnerships refers to the durability of a partnership in terms of its effectiveness and attainment of superior value for the PPPs (Zou et al., 2014). Partnerships form at the point of awarding the contract and continue over the construction and operational periods of the project (Love et al., 2015). Collective interest is more important than each party's individual interest in the partnership arrangement (McCarter & Kamal, 2013). In our study, the sustainability of partnerships is considered an important performance area, as PPP performance largely depends on the sound state of partnerships. Trust and respect, relationship conflict, private sector knowledge, and public sector capacities are the indicators used for assessing the sustainability of partnerships.

Financing

Financing refers to an arrangement by the project company for investment in the project is often organized by third parties in the form of a consortium for the larger project (World Bank, 2017d). The capacity of a PPP project to be delivered 'on time' and 'on budget' depends on the availability and cost of finance (Engel, Fischer, & Galetovic, 2014a). Further, lack of timely finance for a PPP project becomes more evident in developing countries and greatly affects the actual outcome of the PPPs (Chong & Poole, 2013). Financing includes optimal risk allocation, financial cost, payment, and government guarantees, as well as optimal revenue sharing and government liabilities.

Transparency and accountability

In PPPs, higher levels of transparency and accountability KPAs create safeguards to ensure that public services are not compromised for the sake of private profits (Forrer, Kee, Newcomer, & Boyer, 2010). While transparency is a new focus of concern in advanced countries, it requires extra attention in developing countries, since the PPPs in the latter are implemented in a relatively poor operating environment. Empirical evidence suggests a negative relationship of PPP performance with transparency and accountability in developing countries (Hammami et al., 2006). The transparency and accountability area comprises indicators such as the integration of locals, the disclosure of project information, the life cycle evaluation and the monitoring and responsiveness of concessionaire.

Stakeholder satisfaction

Satisfaction differs for the different stakeholders in PPPs, based on their involvement as a public or private party or as users. A PPP project may be considered successful from a private point of view; however, it may be unsuccessful from a public point of view (Liyanage & Villalba-Romero, 2015). In this study, we broadly consider two types of stakeholders, the partnering parties (private and public sector) and the end users, in measuring their satisfaction level on the project performances, based on the perceptions of the survey respondents. For measuring partner satisfaction, the indicators that are taken into consideration include meeting objectives, value for money, profitability and efficient risk management. For measuring end user satisfaction, appropriate indicators include economy, availability, and quality of the services.

Socioeconomic development

Socioeconomic development refers to the ultimate benefit from the project for the economy and society in the long run. It depends on the benefits realised and the costs incurred by PPPs. A careful assessment of benefits and costs is needed to understand the order of magnitude of the socioeconomic development that may be realised by PPPs (Adighibe, 2015). This area includes five indicators: PPP sector development, innovation in the public sector, infrastructure development, employment generation, and environmental friendliness.

2.6.3 Defining performance indicators

Table 2.2 represents a comprehensive list of forty-one performance indicators, grouped under the eight KPAs we derived from our review of extant literature. Some of these indicators are selected based on understanding gained from the discussion in the references cited in table 2.2. Clustering of these identified indicators considers each indicator's relevance to a particular KPA, the degree of the performance of that KPA it represents, and its place in the life cycle of a project. Indicators that appear repeatedly in the project life are included in the KPA in which they first appear. However, most of the indicators belong to KPAs in a sequential order relating to the different phases that appear one after another in the life cycle process of PPPs.

Table 2. 2: Key performance areas and indicators/sub-indicators with their definitions

Codes	KPAs/Indicators/Sub-indicators	Definitions	References
PI	**Planning and initiation:**		
NA	Needs assessment	An assessment of the necessity to justify the project undertaken	(Tsunoda & Islam, 2014)
SO	SMART objectives	Objectives of the projects are clearly defined (S= Specific, M=Measurable, A= Achievable, R=Realistic, and T=Time bound)	(Liyanage & Villalba-Romero, 2015)
IA	Implementability assessment	An assessment of the likelihood of execution of the project in terms of resources and operational environment it requires.	(Yuan, Wang, et al., 2012)
FA	Feasibility analysis	An analysis of whether the project is commercially or socially viable	(Tsunoda & Islam, 2014)
PIT	Public interest test	A systematic test of the public interest for the project	(Zhang, 2005)
T	**Tendering:**		
ECS	Efficient concessionaire selection	Selecting an appropriate private partner that has a reputation and required expertise	(Yuan, Wang, et al., 2012)
SCM	Selection criteria and method	Method and criteria used for selecting an appropriate concessionaire	(Tsunoda & Islam, 2014)
FT	Fairness and transparency	A competitive environment where impartiality and transparency are granted in the whole of the procurement process	(De Jong et al., 2010; Tsunoda & Islam, 2014)
SC	Standardized contract	A format of a uniform contract agreement that is centrally designed and locally implemented, with necessary flexibility	(Van Den Hurk & Verhoest, 2016)
CO	**Construction & Operation:**		
C	Cost performance	The variation of the total cost required to complete a project, such as on budget, below budget or beyond budget	(Raisbeck et al., 2010)
TC	Time performance	The variation of time required to complete a project, such as ahead of time, on-time or after time	(Raisbeck et al., 2010)
Qa	Quality of assets	An excellence of construction and maintenance of the project	(Yeung, Chan, Chan, & Li, 2007)
LCM	Life cycle maintainability	Ability to continue maintenance over the project life without any trouble, e.g., technical and financial difficulties	(Love et al., 2015)
DS	Dispute settlement	The number of disputes arising annually and the time each dispute takes to settle	(Yeung et al., 2007)
SP	**Sustainability of partnerships:**		
TR	Trust and respect	Level of mutual trust and respect among the different stakeholders	(Yeung et al., 2007)
RD	Relationship dilemmas	A state of relationship problems between parties, where partner's individual interest contradicts with partner's collective interest	(McCarter & Kamal, 2013)
PrKS	Private sector's knowledge and expertise	Private sector's ability to gain an optimal efficiency level in design, construction and operation	(Zhang, 2005)
PuCC	Public sector capacities in coordination	Public sector's ability to coordinate different stakeholders successfully	(Yuan, Wang, et al., 2012)
PRR	Partner's roles and responsibilities	The degree of understanding about partner's roles and responsibilities	(Yuan, Wang, et al., 2012)
PrS	Project sustainability	An ability of the project to be sustained in the long run	(Hueskes, Verhoest, & Block, 2017)
F	**Financing:**		
ORA	Optimal allocation of risk	Allocation of risk between the parties efficiently	(Aslan & Duarte, 2014)
FC	Financial cost	Cost that incurs owing to procuring of finances for the project	(Delmon, 2015)
PG	Payments and government guarantees	Amount of payments and government guarantees to the concessionaire	(Aslan & Duarte, 2014)

ORS	Optimal revenue sharing	Prudent sharing of revenues (between parties), which would not dissatisfy partners and create burden for the end users	(Shan, Garvin, & Kumar, 2010)
GL	Government liabilities	Liabilities that might be created due to the availability payment made and guarantees given by government	(Delmon, 2015)
TA	**Transparency and accountability:**		
IL	Integration of the locals	Extent of involvement of the local community with the project initiation and implementation	(Willems & Van Dooren, 2016)
DPI	Disclosure of project information	Level of disclosure of project affairs, milestones and financial information, including equity returns and fiscal commitments	(Delmon, 2015)
LCEM	Life-cycle evaluation and monitoring	A perpetual internal control mechanism that can improves transparency and accountability	(Love et al., 2015)
RC	Responsiveness of concessionaire	Sensitivity of the private party to the locals in respect of complaints and other service related issues	
SS	**Stakeholder satisfaction:**		
PS	***Client satisfaction:***		
MO	Meeting objectives	Achieving objectives of the project, as has been set initially by public sector partner	(Liyanage & Villalba-Romero, 2015)
VFM	Value for money	The monetary amount of efficiency gains from adopting the PPP projects instead of traditional one	(Grimsey & Lewis, 2005)
P	Profitability	Earning profit by the private sector counterpart	(Yuan, Wang, et al., 2012)
ERM	Efficient management of risk	Handling the share of risk as allocated to each of the parties	(Grimsey & Lewis, 2002)
EUS	***End user satisfaction:***		
E	Economy of the services	Charges that the end users pay for the services	(Liyanage & Villalba-Romero, 2015)
A	Availability of the services	Ease of getting the services	
Qs	Quality of the services	Excellence that substantiates the prices of the services	(Yeung et al., 2007)
SED	**Socio-economic development:**		
PSD	PPP sector development	Emergence of a new sector in the economy for constructing and financing PPP projects	(Jordan, 2015)
IPS	Innovation in public sector	An improvement of the service delivery system of public sector organisation through innovation	(Yuan, Wang, et al., 2012)
ID	Infrastructure development	Developing infrastructure without increasing public debt	(World Bank, 2017d)
EG	Employment generation	Number of jobs being created by the project	
EF	Environment friendliness	Developing infrastructure without harming environment	(Yuan, Wang, et al., 2012)

Source: Author

2.7 Research gap and related research questions

From the literature review in this chapter, the conventional performance evaluation approaches, including public sector comparator (PSC) analysis, unweighted key performance indicator systems, life cycle approaches to performance evaluation, and output specifications, appear to be in practice for evaluating PPP performances. These mechanisms appear to be inadequate to reveal the true performances of PPPs. In contrast, the relative significance of the KPAs and the indicators that impact on the overall performance score can provide an improved understanding of the actual performances of PPPs, especially in developing countries, where local elements and project features would be considered when selecting relevant KPAs and indicators. Moreover, the application of an analytical hierarchy process (AHP) to establish the weights of KPAs and indicators in a setting of developing countries, and certainly in Bangladesh, is a new research attempt. Against this backdrop, a research gap has been identified that addresses the following research question: *what are the weights of the different key performance areas (KPAs) and indicators of PPP performance evaluation in developing countries and how do they differ from those of developed countries?*

The next chapter, which provides a review of the general key concepts and typology of PPPs, has focuses particularly on the power sector in Bangladesh.

Chapter Three: Public-private partnerships (PPPs) in developing countries: A focus on the power sector in Bangladesh

3.1 Introduction

This chapter initially presents a review of the key concepts and typology of PPPs (Section 3.2). Subsequently, a special focus has been given to the power sector of developing countries, especially of Bangladesh. It is argued that power sector PPPs significantly contributed to reducing power crises in some developing countries while they failed in some other countries (Section 3.3). Bangladesh has shown notable success in implementing initial power sector PPPs. But cost overruns and schedule lapses occurred in some power projects (Section 3.4, 3.5 and discussed in Chapter 6). Based on these paradoxical circumstances, two related research questions have been formulated in chapter (Section 3.6).

3.2 Understanding PPPs and their taxonomy

3.2.1 Definitions of PPPs

Understanding PPPs is critical to evaluating the performance of PPPs across developing countries. However, one of the challenges in defining universally accepted PPP performance measures relates to the lack of established theories in this relatively new and underdeveloped field of research. PPPs often fail due to a mismatch of the expectations of public and private parties, a lack of clear government objectives and commitment, poorly defined policies, and poor risk management (Kwak, Chih, & Ibbs, 2009). Conversely, PPPs promise significant benefits to the public sector, including reducing government budgetary pressure, transferring risk to the private sector, and increasing the value for money (VFM) in infrastructure investment (Kwak et al., 2009).

Although no single definition of PPP is universally accepted, OECD (2008) defines a PPP as:

"An agreement between the government and one or more private partners (which may include the operators and the financers) according to which the private partners deliver the service in such a manner that the service delivery objectives of the government are aligned with the profit objectives of the private partners and where the effectiveness of the alignment depends on a sufficient transfer of risk to the private partners" (OECD, 2008).

IMF (2006) defines PPP as:

". . .an arrangement where the private sector supplies infrastructure assets and services that traditionally have been provided by the government"(IMF, 2006).

Further, Standard and Poor's (2005) added the aspect of 'length of contract' as medium- to long-term in its definition of PPPs, and delimited that:

"PPP is any medium- to long-term relationship between the public and private sectors, involving the sharing of risks and rewards of multi-sector skills, expertise and finance to deliver desired policy outcomes".

The U.S. Department of Transportation (DOT) defines that:

"Public-private partnerships (P3s) are contractual agreements between a public agency and a private-sector entity that allow for greater private-sector participation in the delivery and financing of transportation projects"(US Department of Transportation, 2017).

The World Bank (2012) has a more comprehensive definition that is more widely used and accepted:

"PPP is a long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears

significant risk and management responsibility, and remuneration is linked to performance"(World Bank, 2018).

Grimsey and Lewis (2005) provided a broader definition:

"PPP fills a space between traditionally procured government projects and full privatisation."

That space has the scope to engage in the short-term management contracts, to go through to the concession contracts, and to enter into the long-term ventures like designing, constructing, operating and delivering services to end users. These ventures generally involve substantial transfer of risks to the private parties.

3.2.2 Taxonomy of PPPs

PPPs cover the whole spectrum between pure public and pure private provisions, with the specific objectives and attributes of the individual project being highly variable. Thus, the types and nature of PPPs are also diverse. Figure 3.1 represents PPP nomenclature and the degree of involvement of the public and private parties in partnerships. It is difficult, but not impossible, to determine exact types. PPPs can be distinguished by the parties involved, by the mode of operation, and by the aims or goals. Further categorisation is possible by the activity, time span and level of institutionalisation (Homkes, 2011). Furthermore, PPP arrangements might be regarded as:

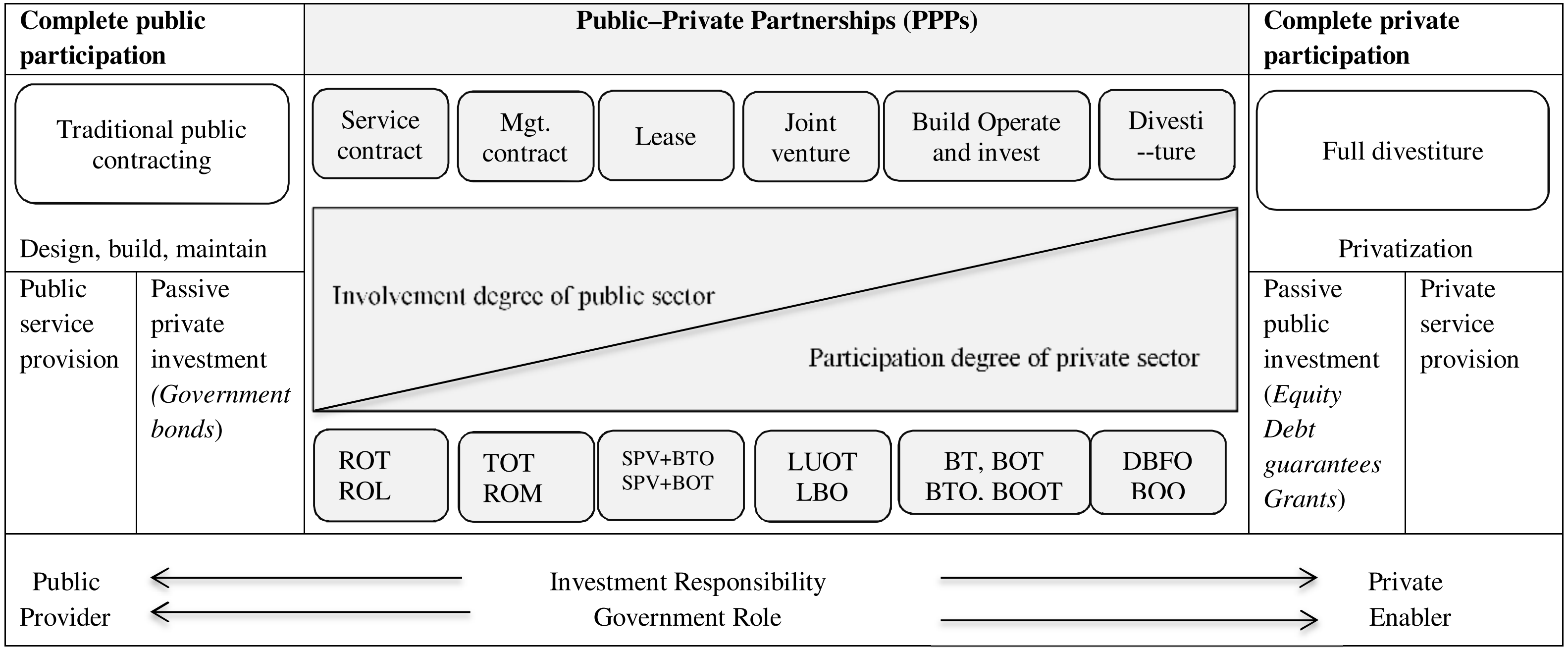
"a) Institutional co-operation for joint production and risk sharing (such as the Netherlands Port Authority), b) Long-term infrastructure contracts (LTICs), which emphasize tight specification of outputs in long-term legal contracts (as exemplified in UK Private Finance Initiative projects), c) Public policy networks (in which loose stakeholder relationships are emphasized), d) Civil society and community development, and e) Urban renewal and

downtown economic development (and where in the USA a portfolio of local economic development and urban re-growth measures are pursued" (Hodge & Greve, 2007, p. 547).

Gaffey (2010) classified PPPs based on characteristics, such as a collaboration between the parties of the planned project, a long-term relation, the funding mechanism, the public welfare issues and the risk transfers. Two approaches in these classifications were argued. The first is a finance-based approach using private funding in the construction and operation of public infrastructure. User fees (based on public demand) are the source of the revenues to repay the private party's investment. The second is a service-based approach that uses private sector skills and innovations in construction and operation in an efficient and effective way. In the second instance, upfront investment that the private party makes for building infrastructure is repaid by an availability payment from the government in exchange for the performance specified in the contract (Gaffey, 2010).

A 'PPP program approach' is an updated version of the PPP types used across various sectors of the European countries, in which a number of individual projects are brought together in order to deliver services in a coordinated manner. For example, projects that have common objectives grouped by the size or geographic consideration are called as the 'PPP program approach'. This approach provides greater benefits than the traditional one, promising a) to develop a market interest for the projects that are, for example, too small or unfamiliar to the market, b) to develop sector based expert teams who are better able to negotiate and manage the projects, c) to develop program-focused standard documents and methods, d) to better share data and experiences, and e) to improve coordination and publicity across the government (EPEC, 2015).

Figure 3. 1: PPP nomenclature and degree of public and private party involvement



Notes:

ROT: Rehabilitate Operate Transfer; ROL: Rehabilitate Operate Leaseback; TOT: Transfer Operate Transfer; ROM: Rehabilitate Operate Manage; LUOT: Lease Upgrade Operate Transfer; LBO: Lease Build Operate; BT: Build Transfer; BOT: Build Operate Transfer; BTO: Build Transfer Operate; BOOT: Build Own Operate Transfer; DBFO: Design Build Finance Operate; BOO: Build Own Operate.

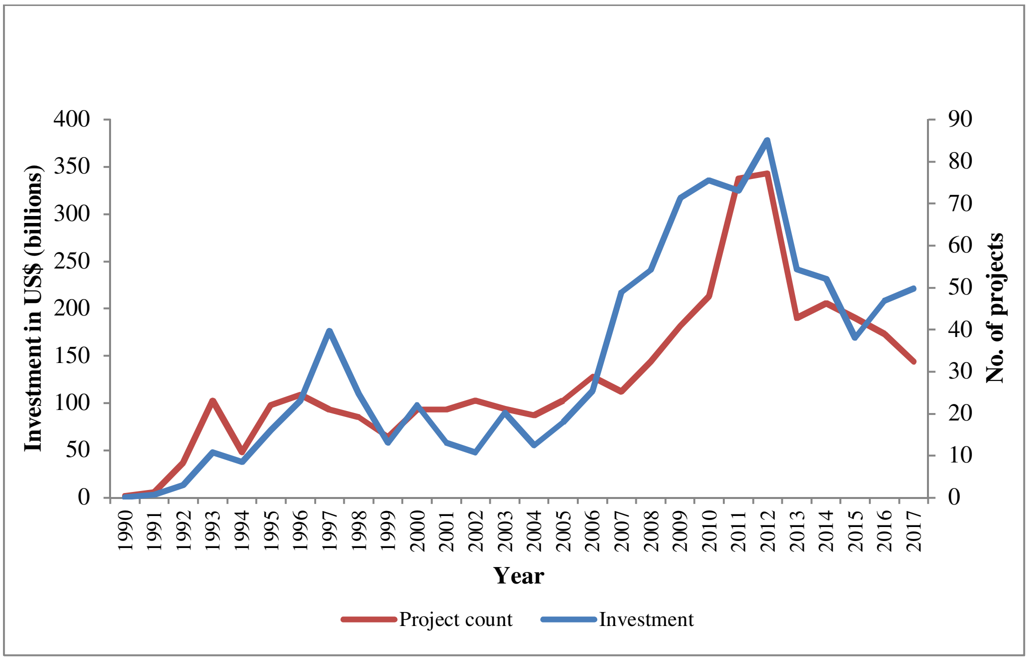
Source: De Jong, Mu, Stead, Ma, & Xi, 2010 ; Xu, 2008.

3.3 Power sector PPPs (IPPs) in developing countries

The independent power producers (IPPs) model started in Turkey in the early 1990s, soon after this, it arrived on the world stage. The model experienced an initial 'boom' through the sheer number of projects, the amount of investment and the number of adopting countries. An estimated 500 private power generation projects, representing US$ 160 billion in around 70 developing countries, were recorded as having reached financial closure between 1990 and 1999. While the geographic dissemination of adopting countries were widespread in six regions, South and East Asian countries led the demand for IPPs (Bhattacharyya, 2010; World Bank PPI Database, 2018). The IPP model initially succeeded in attracting foreign and local investment into the risky venture of investing in power generation in developing countries, with an outcome of mobilising private capital and spreading the model to many countries within a short period of time. However, the 'boom' burst when the Asian financial and macroeconomic crisis emerged in 1997-1998. Because of this crisis, the use and popularity of the model diminished in the late 1990s. A number of host countries defaulted on their contractual promises to sponsors; projects in the pipeline were delayed; some of the contracted projects were renegotiated; and sponsors of some other projects went to international arbitration to enforce their contractual rights (Bhattacharyya, 2010; Izaguirre, 2000).

Developing countries generally have high economic growth targets that require power security. According to the World Bank PPI database, the private investment trend in power sector projects in developing countries increased over the years until 2012, but decreased after 2012 (see figure 3.2). This probably arose because fewer investments were made by some bigger countries, including Brazil and India. However, in 2016 and onward, investment volume again shows an increasing trend. Most of the new investments in power generation focus on renewable energy sources, especially in countries such as Brazil, China, Malaysia and Egypt.

Figure 3. 2: Private investment in power sector in developing countries, 2017



Source: World Bank PPI Database, 2018.

3.4 PPP initiatives in Bangladesh

3.4.1 Evolution of PPPs

In Bangladesh, PPP initiatives can be traced back to the mid-1990s, when they started under the 'Private Sector Power Generation Policy' (PSPGP) in 1996 (Planning Commission GoB, 2016). Before this policy, the government had entered into a number of individual PPP transactions, but had failed to achieve a remarkable success. Under this policy, two large power projects, the Meghnaghat (450MW) and the Haripur (360MW) power plants, were successfully contracted, with World Bank and Asian Development Bank (ADB) support. Building on this success, the government introduced the 'Private Sector Infrastructure Guidelines' in 2004 to support infrastructure development in other areas. Program-based PPP initiatives started under this policy, yet only a handful of projects became successful (Uddin, 2015). However, the need for PPP programs to be successful was evident in order to promote the long-term growth plan for the country to reach the milestone of becoming a high-income country by 2041. Accordingly, the Sixth Five Year Plan (2010-2015) focused on using PPP as a key tool in meeting infrastructure needs that can enable private sector entrepreneurship and can unlock the country's growth potential (Planning Commission GoB, 2012).

In 2010, a more general PPP Policy was introduced alongside a range of reforms including tax incentives for PPP projects and development of a sustainable PPP program across multiple sectors (Uddin, 2015). These reforms were strongly supported by government commitment and by a budgetary allocation of more than US$300 million for PPPs in 2009. The Ministry of Finance created a viability gap fund (VGF) to support PPPs to the extent of up to 30 percent of capital cost (Planning Commission GoB, 2012). In 2012, the PPP Office became operational under the Prime Minister's Department. This Office currently leads the effort to make PPP programs become operational in multiple sectors, including transport, power, housing, tourism, health and zoning. In 2015, the PPP law was enacted, followed by acceptance of several policy statements: 'Policy for Implementing PPP Projects through Government to Government (G2G) Partnership' in 2017, 'Procurement Guidelines for PPP Projects' in 2018 and 'Guidelines for Unsolicited Projects' in 2018. These last two are updated versions of the procurement guidelines framed in 2016 (PPP Authority, 2018; Uddin, 2015). Table 3.1 depicts the evolution of the PPP initiatives of Bangladesh with respect to policy support and the types of projects that have evolved.

Table 3. 1: PPP initiatives in Bangladesh by policy and project dimension, 1995-2018

	Up to 1995	**1996-2004**	**2005-2010**	**2010-2018**
Phase	**Project based PPPs**	**Sector based PPPs**	**Program based PPPs**	**Centrally integrated program PPPs**
Policy		1996: Private Sector Power Generation Policy (PSPGP)	2004: Private Sector Infrastructure Guidelines	2018: Procurement Guidelines for PPP Projects and Guidelines for Unsolicited Projects National Priority Projects Rules 2018 2017: Policy for Implementing PPP Projects through Government to Government (G2G) Partnership 2015: PPP Law 2014: The Procedures for Implementation of PPP Policy and Strategy for Unsolicited Proposals 2012: Guideline for VGF for PPP projects 2012: Guideline & Scheme for PPPTAF 2010: Strategy and Policy for Public Private Partnerships
Project	Fertiliser JV project e.g. KAFCO) Health project e.g. BIRDEM, Heart Foundation	Power Projects e.g. Haripur 360MW & Meghnaghat 450 MW power plants	Power Projects e.g. Dhaka PBS 1 Port Projects e.g. Teknaf Land Port Road Projects (e.g. Hanif Flyover)	Multi-Sectoral Projects e.g. Transport, Port, Power, Health, Zones, Civil Accommodation, Housing, Tourism

Source: PPP Authority, 2018.

3.4.2 Current practices (models) and future trend of PPPs

Current PPP practices

After its launch in the late 1990s, the PPP program experienced different stages. From the project-based phase prior to 1995, it passed through a sector-based phase between 1996 and 2004, into a program-based phase between 2005 and 2010 (see table 3.1). Currently, PPP arrangements implement multi-sectoral projects under a centrally integrated PPP program; this is directed by the PPP Authority, which had been established in 2010 (PPP Authority, 2018).

A complete list of PPP projects in the current pipeline is presented in table 3.2. Along with the traditional sectors that include transport, health and social infrastructure, some new sectors, such as tourism, zone, civil accommodation and textiles, have now entered into the PPP arena (PPP Authority, 2018). Power sector PPPs are implemented by the Power Division under separate policies, with the support of the Bangladesh Power Development Board (BPDB). This is discussed in further detail in section 3.5.

Table 3. 2: List of PPP projects in pipelines in Bangladesh

SL	Sector	Name of the project	Stage of completion
1	Health	Hemodialysis Centre at Chittagong Medical College Hospital	Operational stage
2	Health	Hemodialysis Centre at National Institute of Kidney Diseases and Urology (NIKDU)	Operational stage
3	Zone	Hi-tech Park at Kaliakoir	Construction Stage
4	Transport	Dhaka-Elevated Expressway	Construction Stage
5	Zone	Economic Zone 4 Mongla	Award Stage-contract Signed
6	Transport	2 Jetties at Mongla Port	Award Stage - Contract Signed
7	Zone	Economic Zone 2: Mirersharai	Award Stage - Contract Signed
8	Tourism	Development of Integrated Tourism & Entertainment Village at Cox's Bazar	Award Stage - Contract to be Signed
9	Health	Oboshor: Senior Citizen Health Care and Hospitality Complex at Sreemangal - Sylhet Division	Award Stage – Contract Signed
10	Civil Accommodation	Construction of High-rise Residential Apartment Building for Low- and Middle-Income Group of People at Residential Project Dhaka	Award Stage – Contract Signed
11	Civil Accommodation	Construction of Satellite Township with Multi-storied Flat Building at Section 9 Mirpur-Dhaka	Award Stage Contract to be Signed

Continued………..

12	Social Infrastructure	Development of Occupational Diseases Hospital, Labour Welfare Center and Commercial Complexes at Chasara, Narayanganj	Award Stage Contract to be Signed
13	Social Infrastructure	Development of Occupational Diseases Hospital, Labour Welfare Center and Commercial Complexes at Tongi, Gazipur	Procurement Stage - Negotiation Completed
14	Tourism	Development of a Five-Star Hotel in Chittagong	Procurement Stage - RFP
15	Tourism	Establishment of Intl. Standard Tourism Complex at Existing Motel Upal Compound of BPC at Cox's Bazar	Procurement Stage - IFB
16	Transport	Upgrading of Dhaka Bypass to 4 Lane (Madanpur-Debogram-Bhulta-Joydebpur)	Procurement Stage - RFP
17	Tourism	Naf Tourism Park (Jaliardwip)	Procurement Stage
18	Zone	Hi-Tech Park in Sylhet	Procurement Stage
19	Transport	Construction of Laldia Bulk Terminal	Procurement Stage - RFQ
20	Transport	Flyover from Santinagar to Mawa Road via 4th (New) Bridge over Buriganga River	Procurement Stage - RFQ
21	Tourism	Establishment of 5 Star Hotel with other Facilities at Existing Parjatan Motel Sylhet Compound of BPC Sylhet	Procurement Stage - IFB
22	Education	Medical College and Modernization of Railway Hospital at CRB in Chittagong	Procurement Stage – IFB
23	Civil Accommodation	Development of Shopping Mall with Hotel-cum-Guest House at Bangladesh Railway Land near Chittagong Railway Station, Chittagong	Procurement Stage - IFB
24	Civil Accommodation	Construction of multi-storied Commercial cum Residential Apartment complex with modern amenities at Nasirabad, Chittagong Under PPP	Procurement Stage - IFB
25	Textile	Development of Textile Mill at Demra, Dhaka	Procurement Stage - IFB
26	Textile	Development of Textile Mill at Tongi, Gazipur	Procurement Stage - IFB
27	Housing	Installation of Water Supply, Sewerage, Drainage System & Solid Waste Management System in Purbachal New Town	Procurement Stage - IFB
28	Transport	Improvement of Hatirjheel (Rampura Bridge) -Shekherjaiga-Amulia-Demra Road	Procurement Stage - RFQ
29	Transport	Construction of a New Inland Container Depot (ICD) near Dhirasram Railway Station	Project Development Stage - Detailed Feasibility Study
30	Transport	Dhaka-Chittagong Access Controlled Highway	Project Development Stage - Detailed Feasibility Study
31	Civil Accommodation	Shopping Mall with Hotel-cum-Guest House on the unused Railway land in Khulna	Project Development Stage - Detailed Feasibility Study
32	Zone	Development of Economic Zone (EZ) at Jamalpur	Project Development Stage - Detailed Feasibility Study
33	Tourism	Establishment of Three Star Standard Hotel and other Facilities of Existing Hotel Pashur Compound of BPC at Mongla Bagerhat	Project Development Stage - Detailed Feasibility Study

Continued……

34	Tourism	Establishment of a Five Star Standard Hotel along with an Application Hotel and Training Centre on existing land of BPC at Muzgunni, Khulna	Project Development Stage - Detailed Feasibility Study
35	Shipping	3rd Sea Port (Payra Port Coal Terminal)	Project Development Stage - Detailed Feasibility Study
36	Education	Medical College & Nursing Institute and Modernization Railway Hospital of Kamlapur	Project Development Stage – Advisor Appointment
37	Tourism	Establishment of Sabrang Exclusive Tourism Zone	Project Development Stage – Advisor Appointment
38	Health	Medical College and Modernization of Railway Hospital at Saidpur in Nilphamary	Project Development Stage – Advisor Appointment
39	Health	Medical College and Modernization of Railway Hospital at Paksey in Pabna	Project Development Stage – Advisor Appointment
40	Health	New Modern Medical College & Hospital of 250 beds on the unused land in Khulna	Project Development Stage – Advisor Appointment
41	Transport	Build and Construct Khulna Khan Jahan Ali airport and Special Tourism Zone (STZ) in Khulna	Project Development Stage – Advisor Appointment
42	Research and Development	The Innovation & Innovator Cell (IIC) development	Project Development Stage
43	Energy	Construction of LPG Import, Storage and Bottling Plant at Kumira or any Suitable Place at Chittagong Including Import Facilities of LPG, Jetty, Pipeline and Storage Tanks	CCEA Approved (In Principle)
44	Transport	Construction & Operation of Inland Container Terminal (ICT) at Khanpur	CCEA Approved (In Principle)
45	Zone	IT Village at Mohakhali	CCEA Approved (In Principle)
46	Transport	Hemayetpur-Singair-Manikganj Road	CCEA Approved (In Principle)
47	Transport	2nd Padma Multipurpose Bridge at Paturia-Goalundo	CCEA Approved (In Principle)

Source: PPP Office, 2018.

The model of PPPs currently used for transport projects (road transport) allows most of the risk, including political risk, to be allocated to private partners, except for both land acquisition and brownfield risk (ADB, 2017). The efficiency of risk allocation in transport projects has not yet been proved, since only a few projects are in operation. Among them, sponsors of the Mayor Hanif Flyover are reported to be unhappy as a result of a lower traffic volume compared with initial demand estimates and an increased toll rate (Alam, 2013). A typical risk allocation arrangement in road PPP contracts is shown in table 3.3. By contrast, for allocating risk in the power sector PPPs (IPPs), an independent policy called ‘Private Sector Power Generation Policy’ provides fundamental security packages for private investors (World Bank, 2015). Little is documented, however, about risk allocation practices in other modalities of the currently practiced PPPs, such as in the port, water, housing, tourism, zone and civil accommodation sectors.

Table 3. 3: Typical risk arrangement for road PPPs in Bangladesh

Type of risk	Public	Private	Shared risk
Traffic risk		√	
Collection risk		√	
Competition risk		√	
Government payment risk		√	
Environmental and social risk		√	
Land acquisition risk	√		
Permits		√	
Geotechnical risk		√	
Brownfield risk: inventory studies, property boundaries, project scope	√		
Political risk		√	
Foreign exchange risk		√	

Source: ADB, 2017.

Relative status of PPPs: Bangladesh vs. South Asia

Comparative statistics for the period 1991 to 2017, presented in table 3.4, summarise the relative status of the PPPs implemented in Bangladesh within the South Asian region. In Bangladesh, the energy sector, and in particular the power sector, dominates over other sectors, including transport, telecommunications and water, in the use of PPP arrangements. However, an encouraging number of transport projects are in the pipeline, currently being processed for Bangladesh by the PPP Authority. In comparison to the South Asia region, Bangladesh appears to have received a lower volume of PPP investment, relative to its' population share. While 9 percent of the 1.5 billion people in this region live in Bangladesh, the country shares around 2 percent of the total PPP investment. This indicates that lower investment in this type of project has taken place in Bangladesh, compared to the South Asian regional average. However, the recent increasing trend of applying the PPP approach in transport, economic zones, health and civil accommodation may redress this imbalance in the future.

Table 3. 4: PPP infrastructures by sector, 1991-2017: Bangladesh versus South Asia

Sector	Bangladesh		South Asia	
	Project counts	Value Projects ($US millions)	Project counts	Value Projects ($US millions)
Energy	**58**	**4842**	**774**	**178998**
Operational	58	4842	764	174080
Construction	0	0	0	0
Concluded	0	0	2	4
Distressed	0	0	4	2085
Cancelled	0	0	4	2829
Merged	0	0	0	0
Telecom	**6**	**130**	**44**	**5178**
Operational	4	120	40	4935
Construction	0	0	0	0
Concluded	0	0	0	0
Distressed	2	10	2	10
Cancelled	0	0	2	233
Merged	0	0	0	0
Transport	**6**	**180**	**520**	**105813**
Operational	2	180	478	95267
Construction	0	0	0	0
Concluded	3	0	13	44
Distressed	0	0	0	0
Cancelled	1	0	29	10503
Water and sewerage	**0**	**0**	**18**	**648**
Operational	0	0	17	648
Construction	0	0	0	0
Concluded	0	0	1	0
Distressed	0	0	0	0
Cancelled	0	0	0	0
Total	**70**	**5152**	**1356**	**290637**

Source: World Bank PPI database, 2018.

Future trends of PPPs

Given the current practices, an indication of future trends can be seen. The government has a strong intention of extending PPP procurement to different sectors, depending on the performance of projects already underway in the new sectors represented in table 3.2. The current government intention seems to be clearly articulated in the Seventh Five-Year Plan (Planning Commission GoB, 2016), which assigns 1.8 percent of annual GDP to be invested for PPP procurement of transport and power infrastructure - 1 percent will be for transport while the remaining 0.8 percent for power sector infrastructures. US$3.8b is a target to be invested annually in PPP projects over the next five years, along with a further 30 percent of the Annual Development Program (ADP) (PPP Authority, 2017). The PPP model currently used in different sectors includes BOO, BOT and BROT types that are also common around the developing world (ADB, 2017).

3.5 Power sector PPPs (independent power producers, IPPs) in Bangladesh

3.5.1 Power sector development and its long-term perspective

An overview of the power sector

Bangladesh, one of the emerging countries, has the potential to transform its current status among developing countries to a high-income level by 2041; its government has revealed 'Vision 2041' for this purpose. The country has a target of providing electricity for all by 2021, having a current electrification rate, according to the World Bank, of 76[1] percent, though the government claimed that this reached 80 percent in June 2017 (BPDB Annual Report, 2017). In 1971, when Bangladesh became independent, only 3 percent of the population was connected to electricity. Although there is insufficient generation to meet local demand, the generation and consumption of electricity have increased significantly over the past two decades (World Bank, 2017c). The total installed capacity has increased from 2908 MW in 1997 to 13555 MW in 2017; accordingly, generation has also increased from 2114 MW to 9479 MW. The maximum estimated demand has also increased from 2419 MW to 12644 MW (World Bank, 2015). A brief overview of the status of the power sector of Bangladesh is provided in table 3.5. The gap

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[1] World Bank: https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=BD

between demand and supply, which is increasing and is estimated to be currently around 3,000 MW, can be explained by a rapid increase in the domestic use of electricity. To bridge this gap, the government is committed to attracting private investors to invest in power generation (S. Islam, 2017; World Bank, 2015).

Table 3. 5: Overview of the power sector in Bangladesh in June, 2017

Installed capacity (MW)	13555
Peak demand (MW)	12644
Maximum peak generation (MW)	9479
Number of consumers	NA
Access to electricity:	80%
Urban (2014)	91%
Rural (2014)	51%
Per capita generation	351
Per capita consumption	308
System loss (transmission and distribution)	12.74%
Per unit generation cost (public and private) (Tk/Kwh)	5.24
Per unit fuel cost (thermal plants) (Tk/Kwh)	2.76

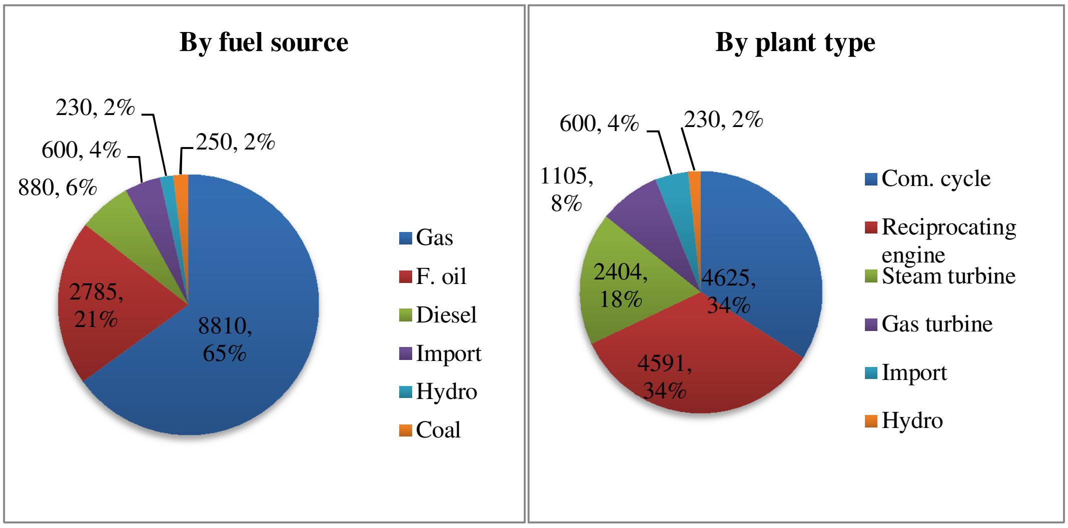
Source: BPDB Annual Report, 2017; World Bank, 2017.

Per capita electricity consumption in Bangladesh, which was 79 kWh two decades ago in 1997, was 308 kWh in 2017.This represents one of the lowest per capita electricity consumption rates in the world (World Bank, 2017c). Moreover, the quality of electricity services cannot be maintained because of the load shedding and the low voltage supply, along with the transmission and distribution losses. Many places in both urban and rural areas suffer from load-shedding almost every alternate hour. Around 79 percent of connected consumers face load-shedding and 60 percent of them face low voltage supply (World Bank, 2017c). While the electricity generation and consumption have increased over the past two decades, the system losses had declined to 11.2 percent in 2015 from 21.2 percent in 2004, as a result of the government reform initiatives adopted for upgrading transmission and distribution lines and for unbundling these services from the authority of BPDB (World Bank, 2017c).

Power generation mix

Figure 3.3 depicts the power generation mix in Bangladesh. Calculated on the type of fuel used, around 65 percent of total generation is based on gas, followed by furnace oil at 21 percent, and diesel at 6 percent, among others (BPDB Annual Report, 2017). The government has recently taken initiatives to reduce dependency on two primary fuel sources, as well as to add to the existing capacity by 1200 MW from two nuclear power plants, expected to be commissioned by the year 2014, and by 7500 MW, from coal based power plants, by 2021 (S. Islam, 2017).

Figure 3. 3: Power generations MW by plant and source type, 2017



Notes: F. oil: Furness oil; Com. Cycle: Combined cycle.

Source: BPDB Annual Report, 2017.

Long term plan for power sector development

Bangladesh has a long-term perspective plan, known as its five-year plan. Currently, the Seventh Five-Year Plan (2016-2020) is based on three themes: (1) GDP growth acceleration, employment generation and rapid poverty reduction; (2) a broad based strategy for enabling every citizen to participate in and benefit from process; and (3) a sustainable development pathway that includes environmental friendliness, sustainable use of natural resources and management of urbanization transition.

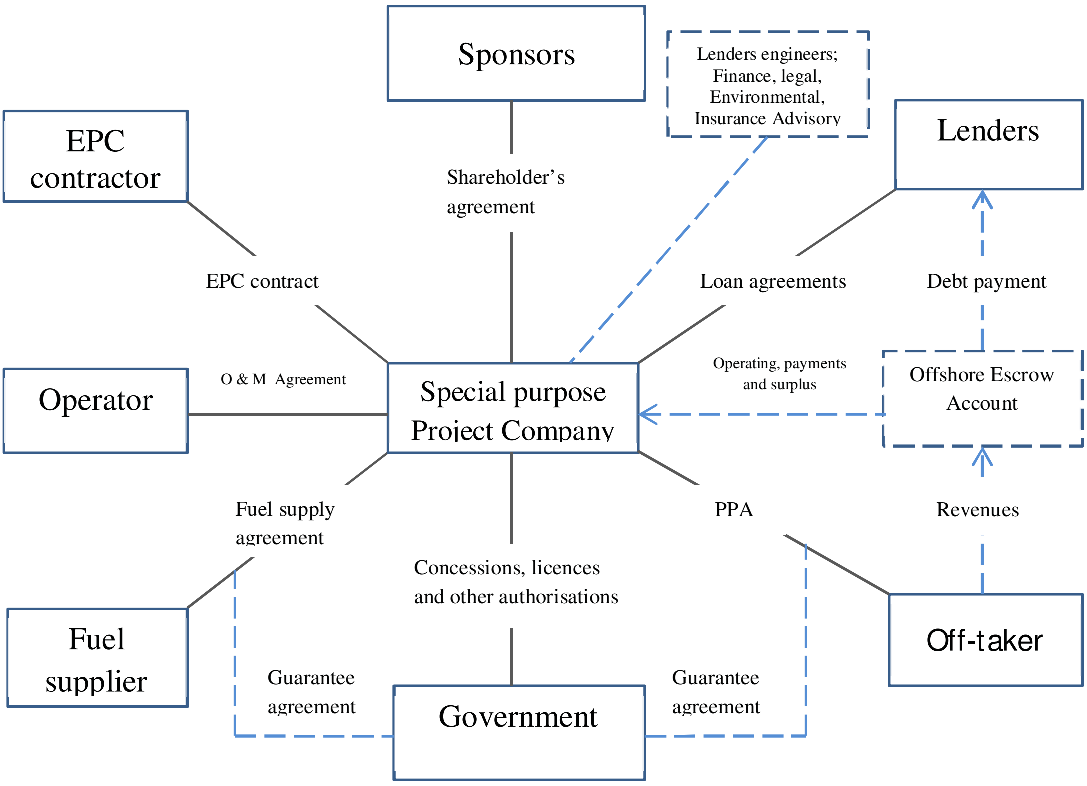
Accelerating GDP growth and achieving other goals depends on power sector development, The Seventh Five-Year Plan has put emphasis on improving the power sector with a target of providing electricity to all by 2021. For this to be achieved, a reliable and affordable power supply is the key, especially to the productive sectors that require major expansion and upgrading of the transmission and distribution system. A target of 60:40 investment mixes between the public and private sectors has already been achieved in 2017, with the private sector providing 44 percent of the total generation capacity, including imported and quick rental power (BPDB Annual Report, 2017).

The government has developed a long-term power sector master plan (hereafter known as PSMP 2010), revised in 2016. Under this blueprint, the government plans to install a generation capacity of 24,000 MW in 2021 against an estimated demand for 20,000 MW, and a generation capacity of 39,000 MW in 2030 against an estimated demand for 33,000. It is expected that around 50 percent generation will be from domestic and imported coal, 23 percent from gas, and the remaining 27 percent from other sources (BPDB Annual Report, 2017).

3.5.2 Institutional set-up for IPP implementation

The Bangladesh Power Development Board (BPDB) was the state-owned monopoly of power system in the country since it was established in 1972. BPDB is also responsible for planning and developing an expansion program for the power sector, and for constructing most public-sector power plants at least cost, along with the functions of transmission and some of the distribution. In a significant move to mobilising the private sector resources in power generation in the late 1990s, the government, under the 'Private Sector Power Generation Policy', provided the BPDB with the authority for implementing power projects through private participation in the form of 'Independent power producers' (IPPs). The structure of a standard IPP model is presented in figure 3.4.

Figure 3. 4: A typical structure of a private power project in Bangladesh

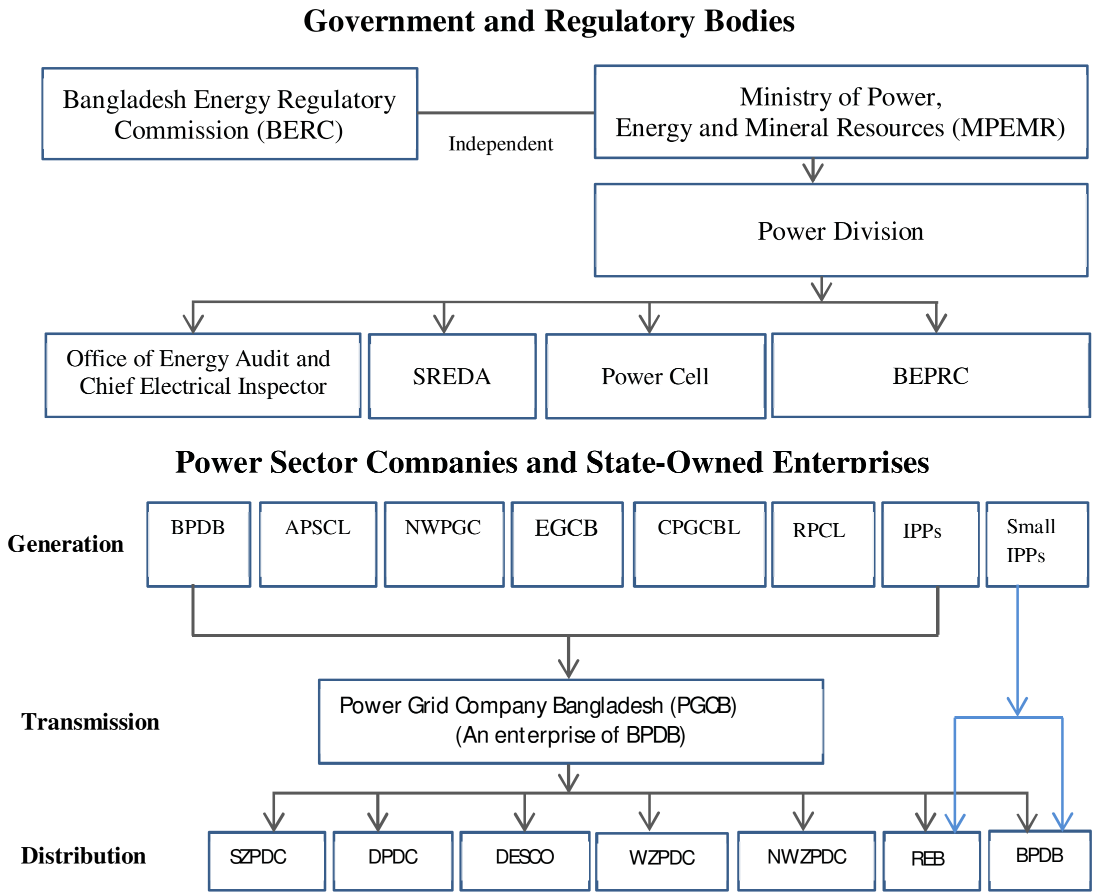


Notes: EPC: Engineering, Procurement and Construction; PPA: Power Supply Agreement; O & M: Operation & maintenance.
Source: Inadomi, 2009; World Bank, 2015.

Institutional set-up of power sector

Figure 3.5 depicts the institutional set-up of the power sector in Bangladesh. The Ministry of Power, Energy, and Mineral Resources (MPEMR) and the Bangladesh Energy Regulatory Commission (BERC) are the two major independent bodies at the top of the structure. While the MPEMR is responsible for the policy making, the planning, and the development of the power sector through its Power Division, the BERC (created in 2003) acts as an impartial regulatory body (ADB, 2016). The BERC determines the tariff of electricity generation and transmission, issues licences, resolves disputes, sets quality of service standards, and monitors the sector under the existing laws.

Figure 3. 5: Institutional framework of the power sector in Bangladesh



Note:
BERC: Bangladesh Energy Regulatory Commission; MPEMR: Ministry of Power, Energy, and Mineral Resources; SREDA: Sustainable and renewable energy development authority; BEPRC: Bangladesh energy and power research council; BPDB: Bangladesh Power Development Board; APSCL: Ashuganj Power Station Company Limited; NWPGC: North West Zone Power Generation Company Limited; EGCB: Electricity Generation Company of Bangladesh; CPGCBL: Coal Power Generation Company Bangladesh Limited; RPCL: Rural Power Company Limited (an IPP); IPP: independent power producer; PGCB: Power Grid Company of Bangladesh Limited; SZPDC: South Zone Power Distribution Company; DPDC: Dhaka Power Distribution Company; WZPDC: West Zone Power Distribution Company; NWPDC: North West Zone Power Distribution Company; REB: Rural Electrification Board; DESCO: Dhaka Electric Supply Company Ltd.
Source: ADB, 2016; Power Division, 2016.

The BERC comprises a chairman and four members appointed by the president on the proposal of the Ministry (World Bank, 2017c). The power division, the most important authority, formulates and implements policies related to power planning, generation and distribution. Under the supervision of this division, four independent authorities were created, based on their specific purposes and technical expertise. The Office of Energy Audit and Chief Electrical Inspector has been created for inspecting and monitoring installation, as well as for issuing licences for higher and medium tension customers, contractors, engineers and electricians (ADB, 2016). The sustainable and renewable energy development authority (SREDA) was established in 2014 to promote renewable energy and energy efficiency (World Bank, 2017c). In 1993, the Power Cell was created as a technical unit assigned to implement reforms and to assist in the design and monitoring of reform measures (ADB, 2016). The Bangladesh Energy and Research Council (BEPRC) has been established to carry out research and development in the energy and power sector. BEPRC is committed to seeking innovative solutions to meet the needs in the power and energy sector, and to provide a platform for the local and international expertise, to work in collaboration for a sustainable and efficient energy solution (Power Division, 2016).

BPDB: The most important entity

Before 1977, the BPDB (a vertically-integrated state-owned organisation) managed the national power system under the direct authorization of MPEMR. In order to develop distribution networks, the government established the Rural Electrification Board (REB) in 1977. In the early 1990s, the government-initiated a power sector reform program focused on vertical unbundling that allowed creation of separate entities for distribution and transmission functions. The government, under this reform, encouraged private sector participation, established an energy regulatory commission (BERC) and shifted to a single buyer market.

The BPDB was disintegrated and different companies for generation, transmission and distribution were created. These include four generation companies, one transmission, and four distribution companies. BPDB has been assigned as the single buyer, purchasing generated electricity from state-owned and private generators and selling electricity it to distribution companies. In 2017, the BPDB and its subsidiaries owned around 56 percent of the country's generation capacity. Private sector generators including IPPs/SIPPs share around 40 percent of the total capacity, while imports from India accounts for the remaining 4 percent. The BPDB is also responsible for distributing electricity in urban areas except the Dhaka Metropolitan area, for which the Dhaka Power Distribution Company (DPDC) and the Dhaka Electric Supply Company (DESCO) are assigned. For urban areas in the south, west, and northwest zones in the country, separate power distribution companies, including the SZPDC, WZPDC, and NWZPDC are assigned. The Rural Electrification Board through the Palli Bidyut Samities (PBS) is assigned for rural areas. Power Grid Company of Bangladesh Limited (PGCB), established in 1996, is another subsidiary of BPDB, and the former owns and operates the transmission system (Power Division, 2018; World Bank, 2017c).

Laws governing power sector

The fundamental law that governs the power sector is the Electricity Act of 1910, which was revised in 2012. The revised law was updated to permit private participation in power sector investments. The mother law defines the functions of the different institutions involved in the provision of electricity services. For engaging private sector in power generation, the government formulated a specific policy called 'Private Sector Power Generation Policy' in 1996, which was later revised in 2004. Following the adoption of this policy, a number of successful power projects (e.g., Haripur Power Ltd and Meghnaghat Power Plant) were implemented. The revised law also promotes developing alternative sources of energy and a time-bound plan to diversify fuel sources, which should include renewable technologies with a principle of least-cost generation (ADB, 2016; Ahamad & Tanin, 2013).

3.5.3 Development, current status and future trend of IPPs

Development of IPPs commences with power sector reform

In 1994, the Government of Bangladesh (GoB) initiated a power sector reform program that envisioned the following: (a) Unbundling of the power sector through separating power generation, transmission and distribution functions; (b) Corporatization and commercialization of evolving power sector entities; (c) Creation of a regulatory agency in the form of Bangladesh Energy Regulatory Commission (BERC); (d) Encouraging private sector participation and PPPs in power sector; (e) Financial restructuring and recovery plan for the sector; (f) Introducing cost reflective tariff for financial viability of the utilities and efficient use of electricity; (g) Development of demand side management (DSM) including energy efficiency measures to conserve energy; (h) Development of alternative/renewable energy resources; and (i) Capacity building and human resource development (HRD) for the sector entities and corporate bodies (PA Consulting Group, 2008; World Bank, 2015).

Private Sector Power Generation Policy for IPPs

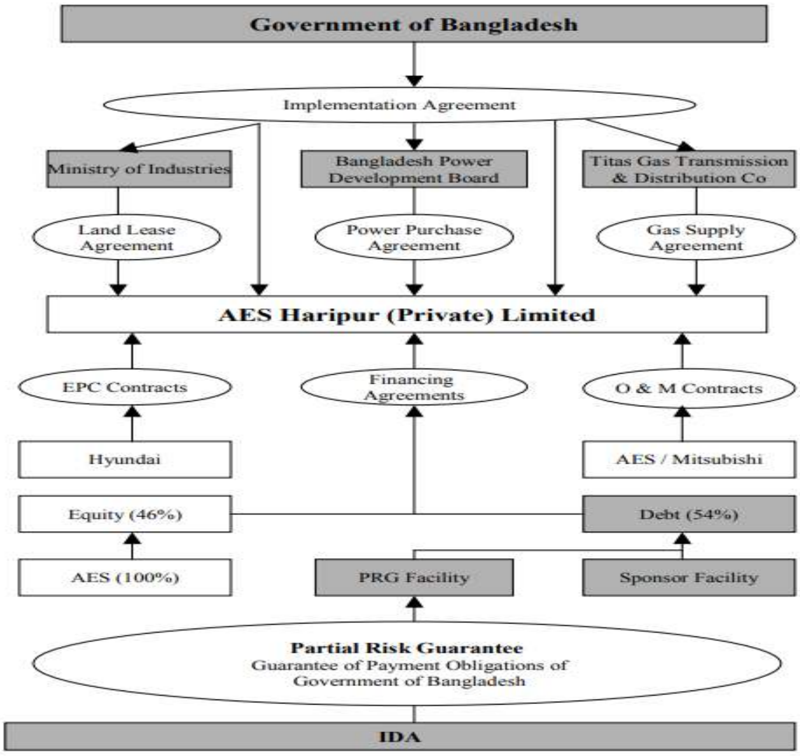
In response to the reform program, the GoB introduced the 'Private Sector Power Generation Policy' that was formulated in 1996 and revised in 2004. The policy elements, together called a 'Fundamental Security Package', includes features that were attractive to national and international power developers, as follows: (a) Model Implementation Agreement (ImA), Power Purchase Agreement (PPA), and Fuel Supply Agreement (FSA); (b) The PPA guarantees to purchase produced power via a single buyer (BPDB); (c) Under the FSA, fuel supply will be guaranteed by the GoB in case the supplier is a public sector organisation. The credit of the state-owned entity is backed by the government and the credit worthiness of the fuel supplier (stated-owned entity) is guaranteed should the required fuel be imported when there is a shortage of gas supply;

(d) The ImA provides guarantees for the adjustment of certain tariff components as a result of variations in the exchange rate, fuel prices and the inflation rate; (e) There shall be exemption from corporate income tax for the private power companies for a period of 15 years; (f) Repatriation facilities for invested capital, profits and dividends shall be provided and local currency (Taka) would be convertible for international payments on the current account (Power Division, 1996; World Bank, 2015).

IPP models in Bangladesh

Following the introduction of this policy, IPPs started to contribute to power generation from the late 1990s. The first successfully commissioned IPPs in Bangladesh were Haripur Power Ltd (360 MW) and Meghnaghat Power Plant-I (450 MW) during 1998-2002. The IPP model used in Bangladesh is a type of PPP. The common attributes of an operating environment and governance structure of a country require a customisation of IPPs (Bhattacharyya, 2010). The commonly used IPP model in developing countries, especially in Bangladesh, is a BOO, BOT, BROT type model, for which a long-term concession is structured to allow the private partner to build the project, operate it for the specified contract term, and transfer its ownership to the sponsors upon expiry of this term (World Bank PPI Database, 2018). Two types of IPPs are in existence: IPPs and SIPPs. While IPPs are independent power producers that have a relatively longer-term contract, SIPPs are short-term IPPs that are usually in operation for only three to five years. For these models, the host country provides a legal framework that facilitates sponsors meeting performance obligations and payment for the provision of private services (ADB, 2017; N. Islam, 2015). For example, in Bangladesh, the 'Private Sector Power Generation Policy-1996' provided a fundamental security package that includes a guarantee for implementing a project, purchasing electricity, and supplying fuel, and an indemnity for paying the financial obligations if the borrowing entity defaults (Power Division, 1996). A representation of a typical IPP is provided in figure 3.6.

Figure 3. 6: A typical model of IPP (Haripur Power Ltd) in Bangladesh



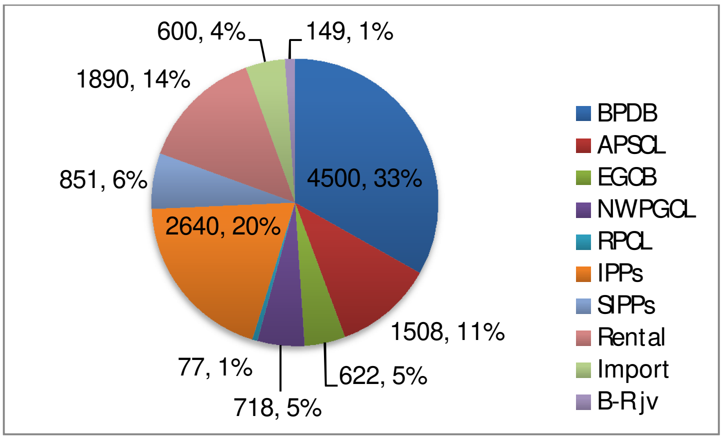
Notes: AES: Applied Energy Services; EPC: Engineering, Procurement and Construction; O & M: Operation & Maintenance; PRG: Partial Risk Guarantee; IDA: International Development Association.

Source: World Bank, 2014.

Current status of IPPs

Out of the total generation capacity in 2017 (see figure 3.7), the private sector accounts for 40 percent while IPPs provide only half of this capacity (BPDB Annual Report, 2017). A detailed list of IPP projects implemented in three phases between 1997 and 2017 is provided in table 3.6. Out of the three phases, the first-phased IPPs were successful. In the second phase, it appears that no new IPPs were undertaken. However, some short-term rentals and highly expensive HFO-fired IPPs were implemented as a quick fix. In the first and second phases, gas was the primary fuel for power plants, especially for IPPs and other public sector plants, while oil was the main fuel for SIPPs and rental plants. Subsequently, dependency on gas decreased and furnace oil-based plants took on greater significance. In the third phase, IPPs gained attention from the new government and a substantial number of projects with bigger capacity have been implemented (World Bank, 2015). Moreover, some coal based and nuclear plants were accepted for implementation during the period 2017-2019.

Figure 3. 7: Power generation (MW) by Sector



Notes:
Public sector: 33% (BPDB)+11% (APSCL)+ 5% (EGCB)+5% (NWPGCL)+1% (RPCL)+ 1% B-R jv = 56%; Private sector: 20% (IPPs)+6% (SIPPS)+14% (Rental)+4% (Import) = 44%.

BPDB: Bangladesh Power Development Board; APSCL: Ashuganj Power Supply Company Ltd; EGCB: Electricity Generation Company of Bangladesh; NWPGCL: North West Power Generation Company Ltd; RPCL: Rural Power Company Ltd; IPPs: Independent power producers; SIPPs: Small independent power producers; B-R jv: B-R Powergen Ltd.

Source: BPDB Annual Report, 2017.

Table 3. 6: PPP power projects (IPPs) implemented from 1997 to June 2017

Year Commissioned	Name of the project	Capacity (MW)	Fuel type
	Phase I:		
1998	Khulna Power Company Limited	110	Furnace oil
1999	Baghabari, WESTMONT, GT	90	Gas
1999	NEPC, Haripur, Gas Generator	110	Gas
2001	Rural Power Co. Ltd. (RPCL), Mymensingh,	140	Gas
2001	AES, Haripur CC	360	Gas
2002	AES, Meghnaghat Ltd.	450	Gas
2003	Summit Power Co. Ltd. (Dhaka PBS-1, Narsingdi PBS-1, Comilla PBS-1)	30	Gas
	Phase II:		
	No IPP project between 2004 to 2005		
2006	2nd Baghabari, WESTMONT, GT	40	Gas
2006	Rural Power Co. Ltd. (RPCL), Mymensingh, GT	70	Gas
2006	Summit Power Co. Ltd. (Narsingdi PBS-1)	24	Gas
2006	Summit Power Co. Ltd. (Comilla PBS-1)	13	Gas
2007	Summit Power Co. Ltd. (Dhaka PBS-1)	25	Gas
2008	Meghnaghat CC (2nd Phase); BON Consortium	450	Gas
	Phase III:		
2009	Regent Power IPP	20	Gas
2009	Saiham Power IPP	10	Gas
	No IPP project between 2010 to 2012		
2013	Ashuganj 51 MW	51	Heavy fuel oil
	Shajanullah Power Company	25	Gas
2014	Natore, Rajshahi 50 MW	52	Heavy fuel oil
	Baraka-Patenga Chittagong	50	Heavy fuel oil
	Meghnaghat 300-450 MW CCPP (2nd Unit Dual Fuel:SC GT Unit)	203	Heavy fuel oil
	Gogonnagar 100 MW PP	102	Gas
	Ghorasal, Narsindi 100 MW	108	Gas
	Comilla (Jangalia) 50 MW	52	Gas
2015	Potiya, Chittagong 108 MW Power Plant	108	Gas
	Kathpotti, Munshigonj 50 MW	51	Furness oil
	Ashugonj 195 MW Modular	195	Furness oil
	Meghnaghat 335 MW CCPP (2nd Unit) : ST Unit	102	Furness oil
	Bibiana-(II) 341 MW CCPP (Summit): GT Unit	222	Furness oil
	Bibiana-(II) 341 MW CCPP (Summit): ST Unit	119	Gas/Furness oil
2016	Madangonj 55 MW Peaking Plant	55	Furness oil
	Barisal 110 MW PP (Summit Power)	110	Furness oil
	Nababgonj 55 MW	55	Furness oil
	Manikganj 55 MW	55	Furness oil
	Jamalpur 95 MW	95	Gas/Furness oil
2017	Bosila, Keranigonj 108 MW (CLC Power)	108	Furness oil
	Kamalaghat 50 MW PP	54	Furness oil
	Kusiara 163 MW CCPP	163	Gas

Source: BPDB Annual Report, 2017; Power Division, 2016.

Future trends of IPPs

For achieving the goal of providing electricity to all by 2021, the government has already undertaken some mega projects for developing a generation capacity of 24,000 MW by 2021 and 39,000 MW by 2030. Out of the total capacity, development of 13221 MW through IPPs is under construction (see table 3.7 and figure 3.8).

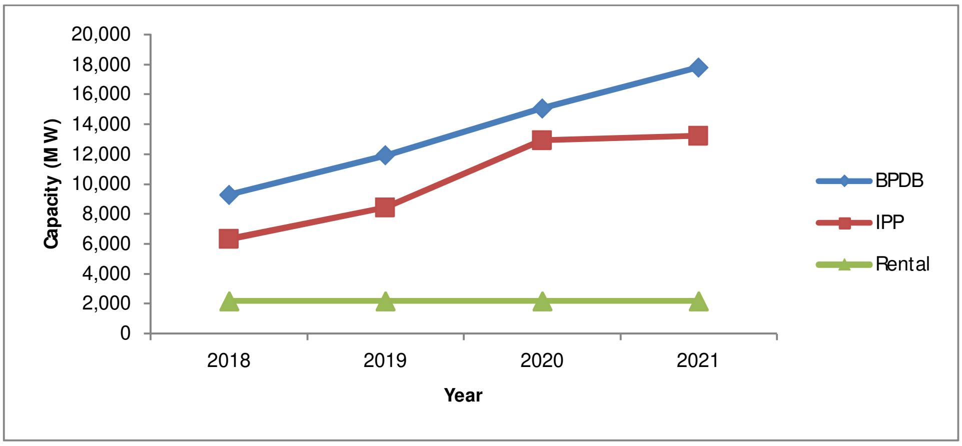
Table 3. 7: PPP power projects (IPPs) currently being implemented, 2018

Year commissioned	Name of the project	Capacity (MW)	Fuel type
2018	Daodkandi 200 MW	200	High speed diesel
	Noapara 100 MW	100	High speed diesel
	Aorahati, Keranigonj 100 MW	100	High speed diesel
	Brahmangaon, Keranigonj 100 MW	100	High speed diesel
	Keranigonj 300 MW	300	High speed diesel
	Bogra 113 MW PP	113	Furness oil
	Ashugonj 150 MW	150	Furness oil
	Labonchora, Khulna 110 MW	110	Furness oil
	Kodda, Gazipur 300 MW	300	Furness oil
	Julda, CTG 100 MW PP	100	Furness oil
	Chnadpur 200 MW PP	200	Furness oil
	Mymenshing 200 MW PP	200	Furness oil
	Potia, Chittagong 54 MW	54	Furness oil
	Gazipur 150 MW	149	Furness oil
	Julda, Chittagong 100 MW	100	Furness oil
2019	Sirajganj 414 MW CCPP	414	Gas/High speed diesel
	Chandpur 100 MW Power Plant	115	Furness oil
	Choumohoni, Noakhali 100 MW	113	Furness oil
	Feni 100 MW Power Plant	114	Furness oil
	Meghnaghat 100 MW Power Plant	104	Furness oil
	Thakurgao 100 MW Power Plant	115	Furness oil
	Rangpur100 MW Power Plant	113	Furness oil
	Bogra 100 MW Power Plant	113	Furness oil
	Jamalpur 100 MW Power Plant	115	Furness oil
	Anowara, Chittagong 300 MW	300	Furness oil
	Shikalbaha 110 MW (Kornofuly Power)	110	Furness oil
	Potiya, Chittagong 100 MW (Pricisan Energy)	116	Furness oil
	Bhairab 50 MW	54	Furness oil
	Bhola 220 MW CCPP (D/F) (Saporji Palonji)	220	Gas/High speed diesel
2020	LNG based 750 MW CCPP (Reliance)	718	Liquefied Natural Gas
	Meghnaghat 500 MW CCPP (Summit)	583	Liquefied Natural Gas
	Chittagong 612 MW (S.Alam Group)-1	612	Imported Coal
	Chittagong 612 MW (S.Alam Group)-2	612	Imported Coal
	Fenchugonj 50 MW	55	Gas
	Gabtoli 108 MW	108	Furness oil
	Khulna (Orion group)	630	Imported coal
	Maowa (Orion group)	522	Imported coal
	Dhaka (Orion group)	630	Imported coal
2021	Borisal 307 MW Coal Fired Power Plant	307	Imported coal

Source: BPDB Annual Report, 2017; Power Division, 2016.

This development through IPPs shows an indication of a future trend of rising private investment in power generation along with the public sector while the rental option will remain fixed over the years. The rental projects will mature in the near future and will disappear from the sector unless the government renews them for another term. As per PSMP 2016, the government will aim to shift from implementing short-term rental power projects to developing mega power projects by including both the private and public sectors.

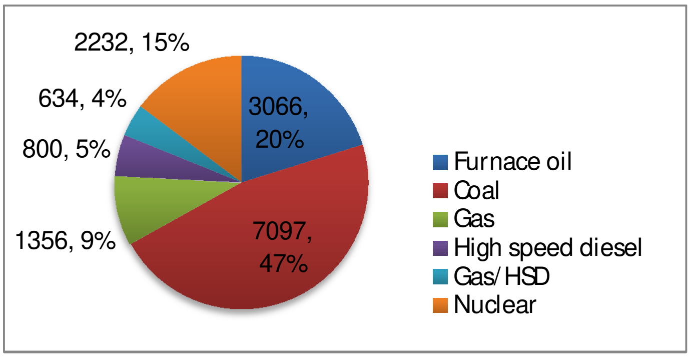
Figure 3. 8: Projected generation capacity by sector, 2018-2021



Source: PSMP, 2016.

The government has also adopted a strategy for diversifying primary fuel sources; it is expected that more than 50 percent of generation by 2030 will be from domestic and imported coal, 23 percent from gas, and the remaining 27 percent will come from other sources (BPDB Annual Report, 2017). The outcomes of fuel diversification have already become a reality (see figure 3.9).

Figure 3. 9: Installation of additional capacity (MW) (estimated) by fuel type by 2025



Note: HSD: High Speed Diesel.

Source: Power Division, 2016.

As figure 3.9 shows, 47 percent of the fuel source will be from coal (both domestic and imported), adding 15185 MW to the existing capacity, followed by furnace oil, nuclear power and gas. This result indicates a significant improvement towards reducing dependency on gas as the primary source.

Through private participation, five mega IPP projects are currently implemented in the Dhaka, Khulna and Chittagong region and are scheduled to be completed by 2021 (see table 3.7). The Orion Group and the S. Alam Group, two local conglomerates, won the contracts and are developing these projects; each project has a capacity of more than 500 MW. For the first time in Bangladesh, two nuclear power plants, located 160 km northwest of Dhaka, are being implemented by Russian nuclear technology. Each project has a capacity of more than 1000 MW (see table 3.8). Both of these projects are expected to commence their commercial operation by 2025.

Table 3. 8: Coal-based and nuclear power projects by public sector, 2018

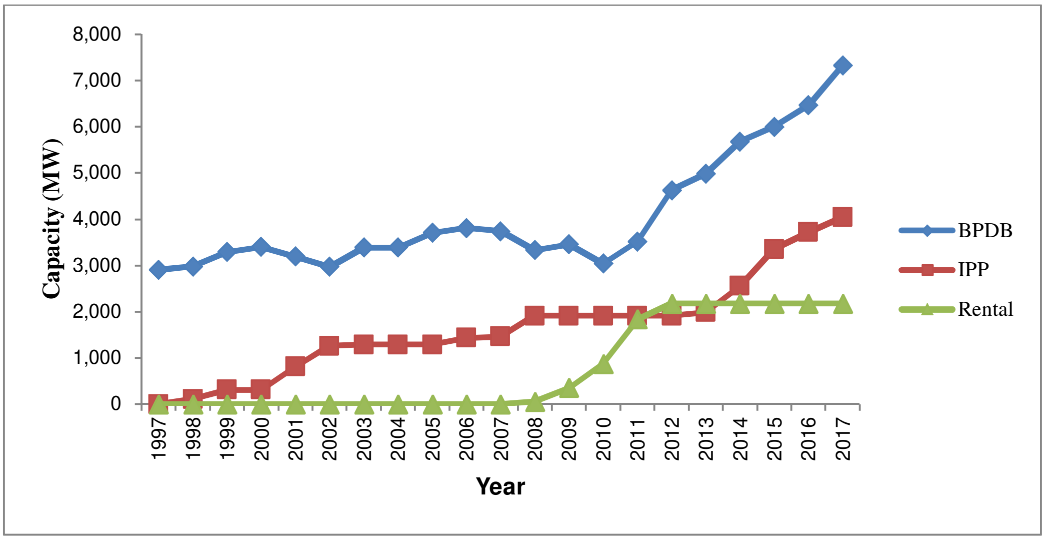
Name of the project	**Ownership type**	**Capacity (MW)**	**Expected commissioning year**
Barapukuria 275MW (Unit 3) (Coal)	BPDB	252	2019
Matarbari unit 1,& 2 (Coal)	BPDB	1104	2023
Ramapal unit 1, & 2 (Coal)	BPDB	1214	2020
Payra unit 1, & 2 (Coal)	BPDB	1214	2020
Roopoor 1st unit (Nuclear)	BPDB	1116	2024
Roopoor 2nd unit (Nuclear)	BPDB	1116	2025

Source: BPDB Annual Report, 2017; Power Division, 2016.

3.5.4 *An assessment of IPPs*

One of the objectives of undertaking power projects through IPPs was to utilise private sector resources for power generation because of government budgetary limitations (Planning Commission GoB, 2012). Participation of multilateral lenders (such as the World Bank and the Asian Development Bank) made the first-phased IPPs successful. Their involvement was critical, given their experience in lending in emerging markets and their ability to provide credit enhancement facilities that included political risk insurance (M. Khan et al., 2012; World Bank, 2015). During the period 1998 to 2002, two IPP projects (Haripur Power Ltd and Meghnaghat Power Plant) contributed to a lion's share of generation capacity (see figure 3.10). These two, along with some other small private power projects, were considered successful and became examples for other developing countries to follow. The measures of success included achieving the commercial operation date on time and implementing the projects within the agreed budget (World Bank, 2014a). The tariff rate of US$ 0.0273 was the lowest IPP tariff in Bangladesh and one of the lowest to date in the world (Azad, 2002). For developing these projects, efficient concessionaires were selected via a process of competitive tendering, and government commitment to implementing the projects was uncompromising with any other vested interest (S. Khan, 2007).

Figure 3. 10: Installed generation capacity by sector, 1997-2017



Source: BPDB Annual Report, 2017; Power Division, 2016.

This initial success faded after 2001 when the IPP projects that were in the pipeline and at different stages of tendering process faced a deadlock in the period of the successive government. Examples include the Sirajganj 450 MW IPP in 2004 and Bibiyana I. Undertaking new projects was also discouraged (M. Khan et al., 2012). Because of this, from 2003 to 2013, capacity development through private initiatives was insignificant while a little improvement was found in the 2007 to 2008 period, when a military-backed caretaker government assumed the state power (see figure 3.10). In the second phase from 2009 onwards, the subsequent government developed a long-term plan, the 'Power System Master Plan 2010' (PSMP 2010), which aimed at driving short-term solutions to the power crisis. As short-term measures, some quick rental power projects were established, while a number of mega power projects are now being constructed to provide a long-term solution. These mega projects are coal based and nuclear power plants to be developed through both public and private initiatives. Accordingly, capacity installation through the public sector (implemented by BPDB) and IPPs increased sharply from 2014 to 2017, and this is expected to continue until at least 2021. It is also noted from figure 3.10 that capacity development through quick rental projects has remained stagnant over the past few years, meaning that no new quick rentals have been undertaken.

Transparent procurement is critical for PPPs to be successful at the end of the project term. But a small number of players with close connections with the government in Bangladesh make the bidding process uncompetitive, which might lead to an inefficient concessionaire selection. This could be the sign of limited transparency. Furthermore, other issues include that a/the high risk premium, the rent capture at the early stage of project implementation, the prolonged decision making and the examples of only a few recent successes in IPPs should also have an impact on the assessment of PPP initiatives in the power sector in Bangladesh (M. Khan et al., 2012; Transparency International Bangladesh, n.d).

3.6 Research gap and associated research questions

No significant research has been undertaken on evaluating PPP performances, especially power PPPs (IPPs) in Bangladesh and accordingly very limited literature in the context of Bangladesh is available. Based on multilateral agency reports (World Bank, ADB, and IMF), company annual reports, government documents, media commentaries, and other online sources, a critical analysis has been undertaken in this chapter. Bangladesh represents an ideal case for evaluating the performance of power PPPs. It has become one of Asia's success stories in recent years (Basu, 2018). Its PPP operating environment and economic status are comparable to those of other countries in the region. Initially, a number of executed PPPs in Bangladesh showed good performances in the power sector. Conversly, after these initial successes, schedule lapses and cost overruns have become common features (M. Khan et al., 2012).

Nevertheless, the interest in using the PPP option in different sectors, including the power sector, has expanded recently (BPDB Annual Report, 2017; PPP Authority, 2018). However, very little knowledge exists of actual PPP performances and measurement indicators for use in evaluating these performances. This suggests multiples research questions to be addressed in this research: for example, *what are the most important performance areas of the power sector PPPs in Bangladesh using a traditional approach of analysing case experiences? What are the actual performance scores of the sample of power sector PPPs in Bangladesh applying developed weights of KPAs and indicators and how do they differ from unweighted scores derived from industry experts and/or readily available performance assessments?* The next chapter presents details of the methodology used in this study.

Chapter Four: Research methodology

4.1 Introduction

This chapter outlines details of the methodology used in this study. A mixed-method approach utilising both quantitative and qualitative methods is employed (Section 4.2). A multi-criteria decision model, namely the analytical hierarchy process (AHP), is used to attain quantitative preference values for key performance areas (KPAs) and indicators (Section 4.3). Then the case study method is employed for analysing selected case experiences and for applying the developed weights of the KPAs/indicators to those project cases to derive project scores (Section 4.4 and discussed in Chapter 6 and Chapter 7).

4.2 Research process

The research process presented in figure 4.1 is divided into four phases. Phase 1 begins with a fresh research idea in mind, reviews the related literature, then transforms the initial research idea into the final research problem. A set of four research questions (RQs) or objectives were formulated to achieve the overall research objective, which asks how the performance of public–private partnerships (PPPs) can be measured and explained in developing countries? The following four questions are our research objectives:

(RQ1) What are the most appropriate indicators and hence KPAs of PPPs in developing countries?

(RQ2) What are the weights of the different KPAs and indicators in developing countries and how do these weights differ from those in developed countries?

(RQ3) What are the most important performance areas of the power sector PPPs in Bangladesh using a traditional approach of analysing case experiences?

(RQ4) What are the actual performance scores of the sample of power sector PPPs in Bangladesh applying developed weights of KPAs and indicators and how do they differ from unweighted scores derived from industry experts and/or readily available performance assessments?

In Phase 1, we develop both a research outline for this study and a framework of performance indicators for evaluating PPP performances in the developing countries. Through developing the framework, the first research objective is achieved.

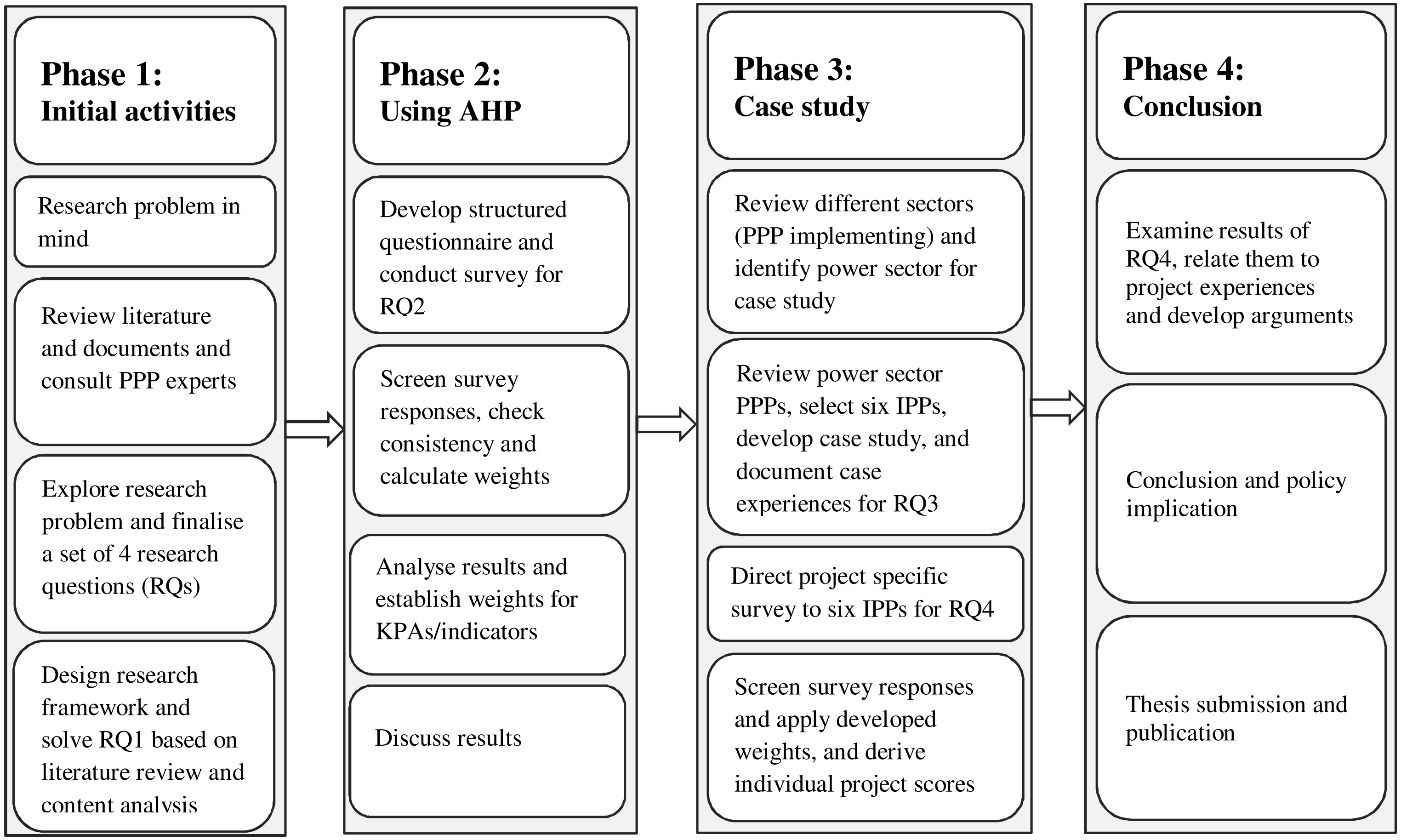
In Phase 2, the weights of the different KPAs and indicators are established, which is our second research objective. The research activities in this phase involve designing the structured questionnaire, conducting the survey, calculating the KPA weights, and analysing and discussing the results. These established weights are later used to derive individual project performance scores by interacting them with Likert scaled scores obtained through a project-specific questionnaire survey conducted in phase 3.

In Phase 3, the case study process begins by reviewing different sectors that have implemented PPPs in Bangladesh. From this comprehensive review, we found the power sector PPPs to be appropriate for the case study. Six projects were selected based on some pre-defined criteria (discussed in section 4.4.3). Each case study was developed by documenting the experiences of the projects that provide the subject matter for the cases. This documentation was used to achieve our third research objective.

For the fourth research objective, a project-specific structured questionnaire survey was conducted at a later stage in this phase to obtain project performance scores against a set of indicators. The scores obtained were then weighted using the AHP weights already established in chapter 5, thereby answering research RQ4.

Finally, in Phase 4, results derived from solving RQ4 are examined and linked to the project experiences, and arguments are developed based on results and with the support of findings from the previous literature. Conclusions are drawn, based on the overall findings of this study, and policy implications are suggested accordingly.

Figure 4. 1: Research process flow



Notes: IPP: Independent power producers.

Source: Author

4.3 Analytical hierarchy process (AHP)

4.3.1 Use of AHP: Overview, scope, sample size and relative advantages

The AHP, a multi-criteria decision model originally developed by Thomas Saaty (1980), is widely used as a mathematical model in solving a complex decision problem with multiple decision criteria. The AHP permits an overall decision problem to be disaggregated into individual elements and allows an analysis of the relationships of these elements with each other (Saaty, 2008; Shen, Muduli, & Barve, 2015). Performance evaluation of PPP projects is a complex task, since the interests of a diverse group of stakeholders are involved in the process of evaluation. Further, there is an information asymmetry in the domain of actual project performance (Hodge & Greve, 2017). Given this context, the AHP is recommended as an appropriate method to employ, as it represents a non-complicated technique and is a powerful tool for processing qualitative data in quantitative terms (Saaty, 2008).

Scope

The AHP has been successfully used in a context of diverse research areas: for example, in assessing the performance of construction organisations (Elwakil, 2017); in developing a water quality index in environmental research (Sutadian, Muttil, Yilmaz, & Perera, 2017); in evaluating supply chain management (Gorane & Kant, 2016); and in proposing policy measures related to methamphetamine consumption and dependency in Australia (Manning, Wong, Ransley, & Smith, 2016). It has also been applied in suggesting PPP housing policies in a complex political, financial and regulatory environment (Yuan, Guang, et al., 2012) and in assessing risk in Chinese Expressway project (Li & Zou, 2011).

Sample size

The AHP normally utilises a relatively small sample size, but the sampled population should have the required expertise, knowledge and experiences of the subject that they are going to judge. Some examples given here of the application of AHP illustrate this use of small sample sizes. Sutadian et al. (2017) surveyed only 15 relevant experts in developing water quality indices (WQIs) in Indonesia. Elwakil (2017) collected the judgments of 63 experts in order to propose a new organisational performance assessment model. He also integrated the AHP with multiple linear regressions (MLR) to identify the critical success factors (CSFs) that are responsible for ensuring better organisational performance. Similarly, using the judgements of only 5 experts, Li and Zou (2011) developed an extended fuzzy AHP technique to assess the risk of a construction project in Hong Kong. Cheung et al. (2001) used survey results from 26 developers and project managers when assessing key factors in procurement selection. In the design development of PPP projects in particular, Raisbeck and Tang (2013) utilised 36 responses from a pool of experts involved in PPP projects in identifying design development factors, in the case of Australia. The AHP process does not require a large sample size since it operates in a structured questionnaire environment (Raisbeck & Tang, 2013).

Relative advantages

The AHP has been applied for determining the weights of indicators because of its relative advantages over other available methods. For example, a large sample size and a linearity assumption of the indicators are required to apply a statistics-based method such as principal component analysis (PCA) (Ali, Ibrahim, Mengersen, Shitan, & Juahir, 2013; Hutcheson & Sofroniou, 1999). But the scarcity of available data and the non-linearity assumption of indicators, in this study, disallow application of the PCA method.

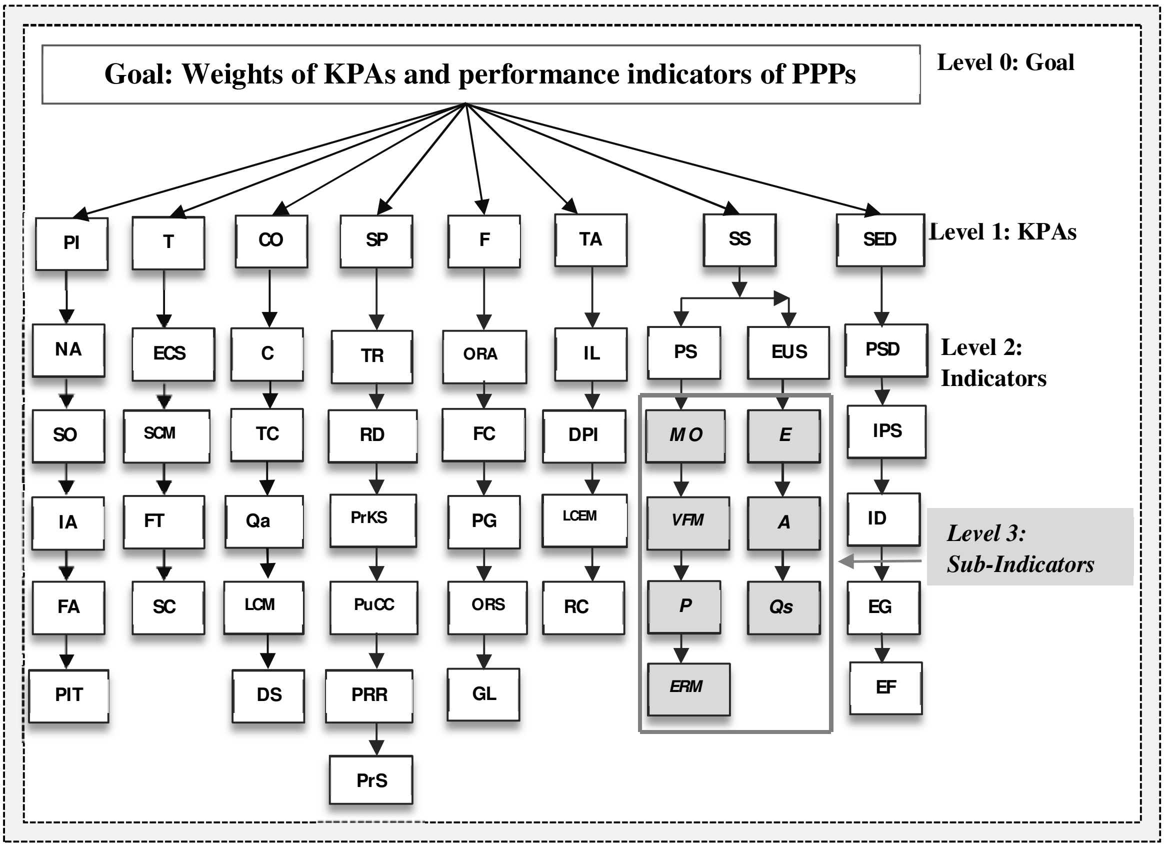
Among the participatory-based methods, the Delphi and AHP methods are commonly used to elicit the judgement of experts in related fields (Yeung, Chan, Chan, Chiang, & Yang, 2012; Yeung et al., 2007). The Delphi method needs to be directed among the experts in several rounds, which needs more time and resources (Franklin & Hart, 2007). By contrast, the AHP approach is simple to use and so is more appropriate for applying transitive ordering of human personal preferences to make pairwise comparisons (Saaty, 1990). Also, it has an attractive feature of generating consistency index that measures the degree of inconsistencies in the judgement of the respondents (Saaty & Vargas, 1984).

4.3.2 Structuring hierarchy of the KPAs and indicators

The first step in developing the AHP includes construction of a hierarchy that contains all KPAs and indicators in relation to a goal that needs to be achieved. At the top of the hierarchy is the goal; below are KPAs in level 1, indicators in level 2, and sub-indicators in level 3. The number of levels varies depending on the type and complexity of the particular decision problem. A hierarchical representation of this study is depicted in figure 4.2.

For our study, forty-one indicators were identified by an extensive review of related literature and consultation with PPP contract documents and practitioners (in Bangladesh). These indicators were then clustered into eight KPAs, based on: (a) their relevance with a particular performance area; (b) their appearance in the time line of the project life cycle, such as the pre-implementation phase or the implementation phase; and (c) their presence in the long run in the economy and society.

Figure 4. 2: AHP hierarchy of KPAs and indicators/sub-indicator



Notes:

PI—Planning and initiation: NA—Needs Assessment; SO—SMART Objectives; IA—Implementability Assessment; FA—Feasibility Analysis; PIT—Public Interest Test. **T—Tendering:** ECS—Efficient Concessionaire Selection; SCM—Selection Criteria and Method; FT—Fairness and Transparency; SC—Standarised Contract. **CO—Construction and operation:** C—Cost Consideration; TC—Time Consideration; Qa.—Quality of assets; LCM—Life Cycle Maintainability; DS—Dispute Settlement. **SP—Sustainability of Partnerships:** TR—Trust and Respect; RD—Relationship Dilemmas; PrKS—Private Sector Knowledge and Skill; PuCC—Public Sector Capacities in Coordination; PRR—Partners roles and Responsibilities; PrS—Project Sustainability. **F—Financing:** ORA—Optimal Risk Allocation; FC—Financial Cost; PG—Payments and Government Guarantees; ORS—Optimal Revenue Sharing; GL—Government Liabilities. **TA—Transparency and Accountability:** IL—Integration of Locals; DPI—Disclosure of Project Information; LCEM—Life Cycle Evaluation and Monitoring; RC—Responsiveness of Concessionaire. **SS—Stakeholders Satisfaction:** PS—Partners Satisfaction: *MO—Meeting Objectives; VFM—Value for Money; P—Profitability; ERM—Efficient Risk Management.* EUS—End Users Satisfaction: *E—Economy of the Services; A—Availability of the Services; Qs—Quality of the Services.* **SED--Socio Economic Development:** PSD—PPP Sector Development; IPS—Innovation in Public Sector; ID—Infrastructure Development; EG—Employment Generation; EF—Environmental Friendliness.

Source: Author

4.3.3 Constructing a pairwise matrix

The next step is to conduct a survey among a group of experts to attain their judgements for each of the KPAs and indicators listed in the decision hierarchy. A semantic scale of 1 to 9 is used to value the pairwise comparisons of the KPAs and sub/indicators. This scale provides options for the experts to evaluate the relative importance of the indicators (Saaty, 2001). The detail of this 1-9 scale is described in table 4.1.

Table 4. 1: The scale of relative importance

Intensity of importance	Definition	Explanation
1	Equal importance	Two elements are of equal importance
3	Moderate importance	Experience and judgement slightly favour one element over another
5	Strong importance	Experience and judgement strongly favour one element over another
7	Very strong importance	An element is strongly favoured and its dominance is demonstrated in practice
9	Absolute importance	The evidence favouring one element over another is of the highest possible affirmation
2, 4, 6, 8	Intermediate values	When compromise is needed

Source: Saaty, 1990.

For example, if KPA_i is 'strongly important' in measuring PPP performance, compared to KPA_j then a respondent might have chosen 5 at the left side in the table 4.2 to value his judgement. Conversely, he has chosen 5 at the right side in the table if KPA_j is 'strongly important' than KPA_i. Using 1 indicates the equal importance of both the KPAs. Likewise, a pairwise comparisons need to be made among the indicators and the sub-indicators.

Table 4. 2: Example of a pairwise comparison

KPA_i	*9*	*8*	*7*	*6*	*5*	*4*	*3*	*2*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	KPA_j

Let a_{ij} (for $i, j = 1, 2, 3, ...n$) be the numerical judgement of a respondent, such that an entry in the ith row and jth column in the Matrix A is given. Then for each KPA, there would be an independent matrix following the same dimension $(N \times N)$. Thus, the matrix A would look like the one that is depicted in figure 4.3.

Figure 4. 3: Pairwise comparison matrix

$$A = a_{ij} = \begin{bmatrix} a_{11} & a_{12} & a_{13} & \dots & a_{1N} \\ a_{21} & a_{22} & \dots & \dots & a_{2N} \\ a_{31} & \dots & a_{33} & \dots & a_{3N} \\ \dots & \dots & \dots & \dots & \dots \\ a_{N1} & a_{N2} & a_{N3} & \dots & a_{NN} \end{bmatrix}$$

In figure 4.3, all the diagonal elements of matrix A equal 1 (unity). The lower rectangular values are always a positive reciprocal of the upper rectangular values. Hence, filling in the upper rectangular cells with the judgement values automatically generates positive reciprocal values in the lower rectangular cells of the matrix.

4.3.4 Calculating weights of the KPAs and indicators

The two prioritisation methods commonly used in deriving the priority vector (weights in this study) are either a) the eigenvalue method (EVM), or b) the row geometric mean method (RGMM) (Dong, Zhang, Hong, & Xu, 2010). In this study, the EVM approach has been preferred to row geometric mean method because of the availability of its consistency index. The consistency index generated by EV method has the superiority over the geometric consistency index (GCI) generated by row geometric mean method. It helps separate between judgement matrices that can be maintained and interpreted and matrices that must be rejected (Budescu, Zwick, & Rapoport, 1986; Saaty & Vargas, 1984).

The eigenvector $w_i = \left(w_1, w_2, \ldots, w_n\right)$ is ascertained by algebraic calculation from matrix A, where $w_i > 0$ and sum of $w_i = 1$. Thus, mathematically, the eigenvector of matrix A could be derived by using the following equation:

$$Aw = \lambda_{\max} w \qquad (1)$$

where $\lambda_{\max}$ is the largest eigenvalue of the matrix A and w is the corresponding eigenvector. By normalising the eigenvector for each of the matrix, priority vector (weights) is derived (Saaty, 1990). Normalising each of the matrixes follows the equation:

$$A'w' = \lambda_{\max} w' \tag{2}$$

where $\lambda_{\max}$ is the largest eigenvalue of matrix A'.

4.3.5 Checking consistency of the judgment

Consistency checking involves measurement of the intransitivity of the respondent answers (Manning, Ransley, Smith, Mazerolle, & Cook, 2013). For example, a transitive ordering of preferences is such that if the relative importance of A is greater than B, and B is greater than C, then obviously A is greater than C. This logic of transitivity is considered as an axiom of rationality in relation to the preferences of individuals (Saaty, 1990). In a subjective judgement of a human being, logical consistency is generally more feasible than perfect consistency (Sutadian et al., 2017). Thus, the Consistency Index (CI) is the indicator that tells the 'closeness to consistency' of a set of pairwise comparison judgements:

$$CI = \frac{\lambda_{\max} - n}{n-1} \tag{3}$$

where CI is the Consistency Index, n is the dimensions, and $\lambda_{\max}$ is the largest eigenvalue of the matrix A. $\lambda_{\max}$ is the most important estimate that measures the consistency of the experts' judgement. It always equals n if and only if A is a perfectly consistent matrix and equals or greater than n if A is a reciprocal matrix. Thus, the closer an estimate of $\lambda_{\max}$ is to n, the more consistent the judgement is (Saaty, 1990). For particular different dimensions of the matrix, a Random Index (RI) based on mean

CI values across judgements has been generated (Saaty, 1980). The Consistency Ratio (CR) is then calculated using the following equation:

$$CR = \frac{CI}{RI} \tag{4}$$

In general, $CR > 0.10$ is considered acceptable. However, in the case of a large number of criteria in a comparison matrix CR tends to exceed the general standard of 0.10. Further review of the judgement of respondents might result in better consistency. In this study, respondents with inconsistencies were requested to revise their pairwise comparisons to reduce the inconsistent ordering of the preferences.

Geometric consistency index (GCI)

Given a pairwise comparison matrix $A = a_{ij}$ with $i, j = 1, 2, ...n$ and priority vector, w, using RGMM, the GCI is given (Crawford & Williams, 1985):

$$GCI = \frac{2}{(n-1)(n-2)} \Sigma_{i<j} (\log a_{ij} - \log \frac{w_i}{w_j}) \tag{5}$$

where $\frac{w_i}{w_j}$ is the ratio of the priority vectors.

4.3.6 Aggregating individual weights

The next step involves synthesising the weights found in the different levels of the hierarchy to obtain global weights of the sub/indicators by employing one of two possible aggregating approaches: aggregating individual priorities (AIP) or aggregating individual judgements (AIJ) (Dong et al., 2010). In AIJ, the individual judgment matrix is aggregated to obtain a collective judgment matrix, from which a collective weight is derived. In AIP, individual weights are elicited first and then aggregated to derive collective weights. Proponents of AIP argue that the Pareto principle of social choice theory is violated when using the AIJ method (Ramanathan & Ganesh, 1994). Again, application of the AIJ or AIP depends on whether the groups behave as a synergistic unit or as a collective of individuals (Cao, Leung, & Law, 2008). Barzilai and Golany (1994) argue, however, that both the approaches generate very similar results (Barzilai & Golany, 1994).

In this study, the AIP is applied by aggregating individual priorities in each level of the hierarchy. Aggregation could be done based on either weighted arithmetic means or weighted geometric means (Forman & Peniwati, 1998). In this study, the weighted geometric mean method is applied for three reasons: (a) the geometric mean method satisfies both the unanimity condition (Pareto principle) and the homogeneity condition (Saaty, 1990); (b) the geometric mean method preserves the symmetric structure of the judgment matrix; and (c) the arithmetic mean method overestimates the group priorities when individual priorities are high (Ishizaka, Balkenborg, & Kaplan, 2009). The derived aggregated priorities are then normalised for each hierarchy level, such that their sums equal unity (1).

4.4 Qualitative approach: Case study method

4.4.1 Case study method and its rationale

The case study method is widely used in social science research. It is a useful method for developing a rich and comprehensive understanding of organisations, programs or projects, processes, institutions and events (Osei-Kyei, 2017; Yin, 2014). In the case study, an investigator has no control over a contemporary set of events and attempts to explore in depth the materials related to each case and, where relevant, by including comparisons to multiple cases of a similar nature. Furthermore, using the case study method is appropriate where a unique situation prevails and has not been a subject of detailed and systematic investigation previously (Liyanage & Villalba-Romero, 2015;

Yin, 2014). However, the case study approach has some limitations when it uses a single case that is inadequate in generalising a conclusion. It also lacks rigour and objectivity. But this approach is recommended in a context where existing theories are inadequate and where the required data is unavailable. In addition, in our research, the developed weights (findings in chapter 5) of KPAs and indicators need to be applied to a number of completed projects to test the effectiveness of this model. Given these circumstances, a case study method appears to be a useful approach in answering research questions 3 and 4 of this research.

Our main research objective relating to the case study is deriving an actual performance score for selected power PPPs by applying the developed weights. To achieve this objective, we adopted an exploratory approach that used in-depth case study research in the first phase of the case study approach, before applying these weights to ascertain individual project performance scores. The three objectives resulting from our application of case study methodology include (1) understanding experiences of power sector PPPs implemented in different phases since the beginning of such initiatives in Bangladesh; (2) identifying key performance areas (KPAs) practically important to power sector PPPs (IPPs) in Bangladesh; and (3) deriving performance scores of completed IPP projects and analysing them with respect to their implication for IPPs' contribution to the sustainable power sector development and the potential challenges to implementing power PPPs.

4.4.2 Case study process

The case study process in this research started with reviewing the literature and government documents available about PPPs in Bangladesh. From the understanding of PPP initiatives in Bangladesh that we had built, we considered that the power sector PPPs (specifically, Independent power producers—IPPs) would be appropriate for answering

RQ3 and RQ4. Detail of the reason for considering power sector PPPs has been stated in sub-section 4.4.3. We selected six IPPs, based on a set of pre-defined criteria (discussed in the following sub-section).

For our case study analysis, specific data and information on these six projects were gathered from different sources, including project annual reports for multiple years, media reports and commentaries, World Bank reports, project company websites, environmental report and other independent analysis. To verify its authenticity, the collected information was cross-checked across multiple sources, especially with reports of financers (including the Dhaka Stock Exchange) and World Bank. Respective project spokespersons were also consulted to allow ambiguity of any information to be removed. This consultation occurred during the administration of a project specific questionnaire survey used to obtain the perceptions of key project personnel related to individual project KPA performances. This questionnaire survey, conducted among key spokespersons for the six selected projects, asked them to provide a score using a Likert scale (1-7 scale) for each of the performance indicators, based on their perception and experiences in the project.

We performed a detailed analysis of the contents of the assembled case study materials in order to understand project experiences that include the objectives of project implementation, its milestones and financing structures, its achievements and its important performance indicators. In the second phase of the case study, the developed weights of KPAs and indicators are applied to the selected IPP projects to derive performance scores for them.

4.4.3 Case selection: Sector focus, sampled cases and their selection criteria

The power sector executed relatively a higher number of PPP projects since PPP option emerges, and these projects are perceived to have a good outcome to improve power shortage in the country. Moreover, this sector has a substantial number of completed projects that are operational and thus considered suitable for performance evaluation (BPDB Annual Report, 2017). In contrast, other sectors such as transport, housing, tourism, hospitals and commercial zoning have recently entered into PPP options (PPP Authority, 2018). Given this background, the power sector PPPs have been considered for evaluating performance of PPP initiatives.

Careful selection of a set of projects is important to avoid a sampling bias that might happen in selecting either the most successful projects or the worst performing ones (Atmo et al., 2017; Raisbeck et al., 2010). Four PPP power projects (IPPs) governed by the 'Private Sector Power Generation Policy' were selected. The remaining two projects, also independent power projects, are implemented and operated by state-owned organisations. These two projects are considered critical for an understanding of their differences, in the form of operations, and of their outcomes.

However, we had to carefully select some specific criteria that may contribute to an appropriate set of six IPP projects. We selected the following five criteria. (1) Projects are to be from a different time period of the IPP era. Two early (implemented during 1997-2001) and four recently implemented (during 2015-2016) projects have been selected. From 2002 to 2011, no projects (IPPs) were implemented. (2) Projects should be in commercial operation for more than 1.5 years. (3) Projects should allow, relatively speaking, better access to information and publicly available documents and other information. (4) Projects should be of a reasonable size, such as a capacity of more than 50MW; (5) Projects should relate to different fuel types to allow for exploration of the impact of this aspect on project performances.

4.5 Ethical consideration

The methodology includes a structured-questionnaire survey by which experts with the experience of PPP implementation in Bangladesh are asked to know their judgement on the relative importance of the KPAs and indicators of PPP performance evaluation. It also includes a project-specific questionnaire for the managers/representatives from the selected projects to collect their assessment on their respective project performance based on their experience and project-specific actual information. Both questionnaires required human involvement in the research process. So, as per the Griffith University Research Ethics Manual (GUREM), ethical clearance was obtained. The related approval number is **GU Ref No: 2016/718.**

4.6 Limitations of the study

Two different approaches have been used as components of the methodology in this research. The AHP process has been used to develop weightings for the KPAs and indicators; the case study method has been used to select and come to understand a sample of completed projects in sufficient depth to usefully apply those weights to derive performance scores for these projects. Obviously, the limitations of each of these methods should be recognised.

4.6.1 Limitations of the AHP

The AHP approach has a number of potential limitations. These weaknesses, discussed in detail in the literature (Harker & Vargas, 1987), include the hierarchy composition, the scale used to measure the intensity of preferences, the potential selection bias in choosing respondents and the degree of ambiguity in the questions asked to the respondents (Manning et al., 2016). Hierarchy configuration is a critical issue when there are alternatives for a decision and when a decision problem cannot be structured hierarchically because of interactions and dependence between lower- and higher-level elements. In that case, the analytical network process (ANP) is more useful instead of AHP (Saaty, 2013). However, as the priorities (weights) are established in ANP in the same way they are established in AHP, our basic objective in this study would still be achieved. Hence, a simple configuration of three levels has helped avoid hierarchical complexities (Manning, 2008).

Regarding the use of the 1-9 scale of measurement, some critics have questioned its ability to precisely measure the intensity of preferences, but Harker and Vargas (1987) has analysed this debate and has proved that this scale can accurately represent the intensity of individual preferences (Manning, 2008). It would be excellent if more representative sampling could be drawn, covering all sectors entering into PPP options, such as housing and accommodation, zoning, tourism and textile sectors. Selection of a substantial number of experienced respondents representing major sectors in Bangladesh has minimised the selection bias. To ensure that the questions asked in the AHP survey were fathomable, clear instructions on how to respond to the questions were provided, as was a verbal clarification of any queries made by respondents.

This model of weighting performance indicators to derive overall performance scores for particular PPP projects has not been practically tested for a large number of cases. Therefore, future research could apply this model to a wider range of completed PPP projects, in order to derive their individual scores in Bangladesh and other developing countries and to test for the sensitivity of the results to differences in weights. Moreover, the experts used for deriving our KPA weights were selected from only one developing country. A wider set of respondents from more developing countries might be useful and would allow for comparison of KPA weights and overall project scores between the Bangladesh and other national contexts.

4.6.2 *Limitations of the case study*

The first limitation of the case study would be the lack of generalisability of the findings from a limited number of cases. Using a case study approach can be argued as lacking rigor and objectivity (Rowley, 2002). Our study would not be an exception to this form of criticism. Selecting only six projects might eliminate potentially important findings that otherwise may be drawn from unattended projects. However, our projects were carefully selected to avoid the potential loss of any significant information from other projects. Pre-defined criteria were set for benchmarking the projects based on some previous similar studies (Atmo & Duffield, 2014; Atmo et al., 2017). In addition, our study was an exploratory one, used to demonstrate the value of the chosen approach for deriving performance scores for individual PPPs. Follow-up research would allow confirmation that the preliminary findings reported in this study would be useful in other industry and/or national contexts.

Secondly, there is a confidentiality concern to disclose project information publicly because the disclosure of some information would provide an advantage to competitors. Projects, such as power PPPs, seem to be relatively sensitive in this respect in developing countries including Bangladesh. However, information collected was verified by a cross check with alternative sources, including independent reports and an analysis of a third party (World Bank, PPI database, environmental reports etc.) to minimise the potential loss of, or bias in relation to, any critically important information.

Thirdly, in the project-specific questionnaire designed to obtain the scores of project performance, a spokesperson for each project was asked to provide a score for their project. However, this person, necessarily a high level official responsible for operating that project, might be biased in scoring positively for the project since they are affiliated with it. Obtaining perceptions with regard to key aspects of project performance from such individuals was considered appropriate and the only possible way of obtaining the information, especially where objective information on performance is unavailable because of their sensitivity to disclosure, with the exception of project annual reports. Such annual reports were fully utilised for documenting case experiences, but they needed to be supplemented by subjective assessments of key project personnel relating to a number of performance indicators not included in these annual reports.

Fourthly, some of the indicators included in our study may have limited practical use in evaluating IPP project performance in Bangladesh, or even in other developing countries. Furthermore, evaluating project performance using these large numbers of indicators appears difficult, such that a more concise list of indicators may be more effective for use in evaluating PPP performance in subsequent studies.

The next chapter presents the outcome of the research findings relating to RQ2: what are the weights of the different KPAs and indicators of PPP performance evaluation in developing countries and how do these weights differ from developed countries?

Chapter Five: Establishing weights of KPAs and performance indicators of PPPs in Bangladesh

5.1 Introduction

This chapter presents the outcome of research findings related to RQ2: what are the weights of the different KPAs and indicators of PPP performance evaluation in developing countries and how do they differ from those of developed countries? In particular, details for establishing weights are provided, including the design and conduct of the survey and the respondent selection criteria (Section 5.2). The weights of the KPAs and performance indicators are established with a reliability analysis (Section 5.3 and 5.4). Finally, a critical discussion of the results derived in this chapter has been made (Section 5.4).

5.2 Establishing weights for KPAs of PPPs in Bangladesh

5.2.1 Questionnaire survey

An AHP supportive structured questionnaire was used to elicit the pairwise comparisons made by the experts of PPPs in Bangladesh on the KPAs and indicators of PPP performance evaluation. In this questionnaire, a semantic scale of 1 to 9 was used to value the pairwise comparisons. The survey was conducted during the period from November 2016 to February 2017. Detailed discussion is presented in the following three sub-sections.

Structure of the questionnaire

The survey questionnaire was designed in two sections. The first section collected background information that related to the respondents, including types of organisation, current position and roles in organisation, and working experiences. The second section was structured into two parts. The first part, which contained eight level-1 KPAs, was organized to allow respondents to make a pairwise comparison of each KPA over the other using Saaty's (1-9) scale. The second part, which outlined indicators and sub-indicators in levels 2 and 3 of the hierarchy, under each of the KPAs, sought pairwise comparisons in relation to the indicators and sub-indicators (see figure 4.2, chapter 4, for a depiction of the hierarchy employed in this research).

Respondent selection criteria

Bangladesh, like most other developing countries, has a very limited number of highly experienced PPP experts. To identify these expert groups, a two-stage sampling approach was used (Osei-Kyei & Chan, 2017a). In the first stage, a purposive sampling was employed based on pre-defined criteria that included:

- Experience and detailed knowledge of PPP arrangements;
- Currently working in one of the PPP projects in Bangladesh;
- Experience of training and educating related employees;
- Engagement in the regulatory body or public sector authority of PPP projects.

Built on these criteria, profiles and relevant information (e.g., names, contact details, designation and so on) relating to the potential respondents were gathered from online and physical sources in relevant organisations and with them a preliminary list was made. In the second stage, we met a number of selected people from the list, visiting their offices with the offer of an information session, and then following up with a request for advice regarding their known peers and others who have experience in PPPs. Some of the experts recommended by these selected individuals were found to already be included in the preliminary list. Other names were added to the list at this stage. The final list was extended to 110 PPP experts (see table 5.1).

These participants belong to organisations such as the national PPP Authority; the PPP cells in four government divisions; two dedicated infrastructure funding bodies, the Infrastructure Development Company Ltd (IDCOL) and the Bangladesh Infrastructure Finance Fund Ltd (BIFFL); one consulting organisation, the Infrastructure Investment Facilitation Company (IIFC); as well as four leading PPP implementing private organisations in Bangladesh. The use of PPPs is highly concentrated within the power and transport sectors, but has recent extension to other sectors, such as housing, tourism, hospitals, and zoning. However, the telecommunication sector is not currently attracting potential PPP investment in Bangladesh.

Table 5. 1: Summary of the respondents

Respondent group	Questionnaires sent	Questionnaires returned (with yrs. of experiences)							Returned Rate (%)
		<5	6-10	11-15	16-20	20>	Total responses	Valid responses	
Private sector	32	3	4	4	1	5	17	17	53
Public sector	31	14	3	1	1	1	20	18	58
Financial	36	18	5	2		1	26	26	72
Academic/ consultant	11	3	2	1	1		7	7	64
Total	**110**	**38**	**14**	**8**	**3**	**7**	**70**	**68**	**62**

Sector-wise break up:	*Valid responses*	*Percentage*
Transport	17	25
Power and energy	24	35
Hospital	4	6
Housing and accommodation	5	7
Water	1	1
Commercial zone	7	10
Tourism	2	3
Academics	4	6
PPP Authority	4	6
Total	68	100

Source: Author

Administration of the survey

Questionnaires were distributed to 110 experts, either by email or by visiting their offices. While most of the questionnaires were administered using a face-to-face approach, some were conducted by using an online Lime Survey and/or via an email with the questionnaire attached. For online responses, detail instructions of how to respond to the questions were added to the questionnaire. Of the 110 experts targeted, and after giving some of the participants reminder via phone calls or email, 70 completed questionnaires were returned (17 from private sector, 20 from public sector, 26 from financial sector and 7 from academic/research organisation). Of these, 68 responses were considered valid; the remaining two were invalid because of their incompleteness. This number, 62 percent of the total eligible PPP experts in the country, represents extremely robust participation for a country like Bangladesh. The highest response rate (72 percent) was recorded with participants from dedicated PPP financing organisations. The responses from the public (58 percent) and private sector (53 percent) groups were close to the average response rate (62 percent). Most of the respondents (76 percent) have experience of between 1 and 10 years with PPPs, which implies that PPP practitioners are generally new in terms of experience; PPP practitioners with long-term experience are extremely rare in the Bangladesh context. Both the sample size and high response rate are adequate for further analysis: for example, Raisbeck and Tang (2013) used 36 responses; Ameyaw and Chan (2015), 40 responses; and Elwakil (2017), 63 responses. The combination of young and experienced practitioners adds to the authenticity and reliability of the responses. A detailed discussion of the reliability of the expert judgement is presented in section 5.4.

5.2.2 Calculating and analysing the weights of KPAs

The weights of the KPAs and the indicators are calculated by using the AHP approach, the details of which have been discussed in chapter 4. Microsoft Excel is usefully applied for calculating the weights by systematically following the steps of the AHP. The resultant weights for KPAs are presented in table 5.2 as a normalised priority vector.

Establishing weights of KPAs and indicators (related to RQ2) using AHP method (scale of 1 to 9) and assessing performance of the selected projects using Likert scale (scale of 1 to 7) are two separate things. Since the two purposes are different, the use of 1-9 scale (used in the AHP) in determining weights does not have any problem with using

1-7 Likert scale to obtain a comparable performance score of the selected projects. This might be clearer with the following discussion.

A semantic scale of 1 to 9 was used to make a pair-wise comparison among the KPAs and indicators to establish weights for them. These weights (numerical values) show relative importance of the KPAs and indicators in measuring project performances. The first purpose here ends with establishing weights. These weights are then interacted with the perceived Likert scaled scores to derive an effective/true score of the KPAs and indicators. Normalization was then done by averaging the total weighted scores of 37 indicators that are used in the performance measurement process in the selected projects. The remaining 4 (41-37) indicators are found unused in these projects for PPP performance measurement and thus dropped from computing their normalized weighted scores. These results are analysed later in this sub-section and discussed in sub-section 5.5.1.

The analysis of the experts' judgements suggests that the KPA 'financing' (F, with a weight of 0.176) is considered to be the most important when measuring the performance of PPPs with respect to developing countries such as Bangladesh. The next, in order of importance, are the KPAs 'planning and initiation' (PI, with 0.162), 'transparency and accountability' (TA, with 0.155), 'tendering' (T, with 0.108), 'stakeholder satisfaction' (SS, with 0.104), 'construction and operation' (CO, with 0.101), 'sustainability of partnerships' (SP, with 0.099) and 'socioeconomic development' (SED, with 0.095) (see table 5.3). The notable weight difference between the top three KPAs and the remaining KPAs indicates that the KPA 'financing', 'planning and initiation', and 'transparency and accountability' are considerably more important than the remaining KPAs for developing countries. While the top KPA, F, received a weight of 0.162, the least important KPA, SED received a weight of 0.095.

Table 5. 2: Pair-wise comparison matrix of KPAs

Level 1: KPAs	PI	T	CO	SP	F	TA	SS	SED	Normalised Priority vector
PI	1	3.5714	1.7143	1.4	5/6	4/5	1	1.2	0.1619
T	2/7	1	2	1.1111	3/5	2/3	1.1667	1	0.1076
CO	4/7	1/2	1	1	2/3	3/4	1.1428	1.375	0.1015
SP	5/7	1	1	1	3/4	4/7	6/7	1	0.0986
F	1.2	1.6667	1.4444	1.3333	1	1.2857	2	2.3333	0.1761
TA	1.25	1.5	1.375	1.75	7/9	1	2	1.2857	0.1552
SS	1	6/7	7/8	1.1667	1/2	1/2	1	1.2	0.1041
SED	5/6	1	3/4	1	3/7	7/9	5/6	1	0.0950

Key performance areas (KPAs): PI: Planning and initiation; T: Tendering; CO: Construction and operation; SP: Sustainability of partnerships; F: Financing; TA: Transparency and accountability; SS: Stakeholder satisfaction; SED: Socioeconomic development.
Source: Author

An alternative measure of understanding the relative importance of the KPAs is also shown in table 5.3 by a scale of 'times more important', compared to the least significant one. The top KPA, F, is 1.85 times more important than the least important one (socioeconomic development). The KPA 'planning and initiation' (PI) is 1.70 and 'transparency and accountability' (TA) is 1.63 times more important than the least important one. These are followed by the KPA 'tendering' (T), 'stakeholder satisfaction' (SS), 'construction and operation' (CO) and 'sustainability of partnerships' (SP). However, the KPA, T, is very close to the least important KPA in respect to relative significance. Accordingly, the KPAs SS, CO and SP also seem closer to the last KPA (SED).

The consistency ratio (CR) and the geometric consistency index (GCI) are two measures for determining the level of consistency for the judgement of a respondent. In table 5.3, CR and GCI are reported for each of the group of respondents and subsequently for all respondents. Both are within acceptable limits, since a CR value of less than 0.10 and a GCI value of less than 0.37 a recommended for n>4, where n is the number of dimensions of the matrix (Dong et al., 2010).

Table 5. 3: Mean weights of KPAs by expert groups

KPAs	Public ($n = 18$)		Private ($n = 17$)		Financial ($n = 26$)		Academics ($n = 7$)		Overall ($n = 68$)	
	Weight *(Times more important*)*	σ	Weight *(Times more important*)*	σ	Weight *(Times more important*)*	σ	Weight *(Times more important*)*	σ	Weight *(Times more important*)*	σ
(F) Financing	0.2143*(2.67)*	0.1285	0.2166*(3.80)*	0.1244	0.1408*(1.52)*	0.1456	0.1323*(2.89)*	0.1268	0.1761*(1.85)*	0.1326
(PI) Planning and initiation	0.1861*(2.32)*	0.0665	0.1595*(2.80)*	0.0522	0.1384*(1.49)*	0.0821	0.1808*(3.95)*	0.1453	0.1619*(1.70)*	0.0813
(TA)Transparency and accountability	0.1239*(1.54)*	0.0542	0.1735*(3.04)*	0.0958	0.1506*(1.62)*	0.0519	0.1831*(4.00)*	0.0531	0.1552*(1.63)*	0.0675
(T) Tendering	0.1271*(1.58)*	0.0520	0.0975*(1.71)*	0.0743	0.0927*(1.00)*	0.0777	0.1393*(3.04)*	0.0606	0.1076*(1.13)*	0.0688
(SS) Stakeholder satisfaction	0.0940*(1.17)*	0.1050	0.0927*(1.63)*	0.0944	0.1069*(1.15)*	0.0626	0.1246*(2.72)*	0.0695	0.1041*(1.10)*	0.0910
(CO) Construction and operation	0.0868*(1.08)*	0.0777	0.0973*(1.71)*	0.1166	0.1322*(1.43)*	0.0913	0.0458*(1.00)*	0.1095	0.1015*(1.07)*	0.0988
(SP) Sustainability of partnerships	0.0802*(1.00)*	0.0638	0.1058*(1.86)*	0.0879	0.1058*(1.14)*	0.0770	0.0921*(2.01)*	0.1226	0.0986*(1.04)*	0.0813
(SED) Socioeconomic development	0.0875*(1.09)*	0.0752	0.0570*(1.00)*	0.0492	0.1326*(1.43)*	0.1069	0.1019*(2.22)*	0.0532	0.0950*(1.00)*	0.0872
CR	0.03		0.10		0.02		0.08		0.03	
GCI	0.10		0.34		0.08		0.28		0.10	

Notes:

Recommended CR<0.10; GCI<0.37for n>4 (Dong et al., 2010). * 'Times more important' shows how many more times a KPA is important compared to the lowest weighted KPA.

n: refers to the number of respondents; σ : Standard deviation; CR: Consistency ratio; GCI: Gross consistency index

Source: Author

5.2.3 *Comparative analysis and ANOVA test*

Comparative analysis

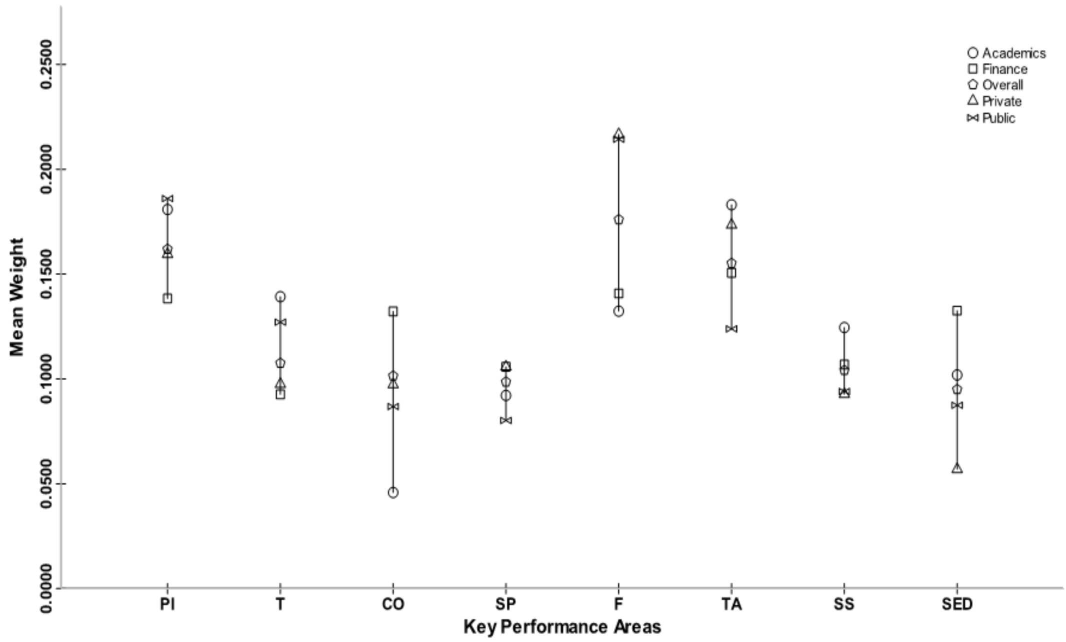
A comparative analysis among the four expert groups, as shown in figure 5.1, reveals that both the private and public sector experts consider KPA 'financing' (F, with a weight of 0.2166 and 0.2143 respectively) to be the most important area responsible for measuring PPP performance, while finance and academic experts consider that 'transparency and accountability' (TA) is the most important KPA (0.1506 and 0.1831). In determining the second most important KPA, the public sector experts and the academics agreed on KPA 'planning and initiation' (PI), while the private sector and the finance experts disagreed. The private sector experts ranked 'tendering' (T) to be second most important KPA, while the finance experts ranked 'financing' (F) in that position.

The public, private and academic groups considered KPA 'tendering' (T) to be moderately significant in evaluating PPP performances, but the financial group perceived it to be the least significant KPA, probably because financiers in PPPs are less concerned about the tendering process itself and are more interested in the business potentiality of PPPs. 'Stakeholder satisfaction' (SS) appears to be a KPA that is equally significant to both the public and private sector respondents, but is less important to academics and financial respondents. This might be associated with the degree of involvement of both sectors in partnerships, while the academic and financial groups seem to be less sensitive to the satisfaction of the stakeholders.

These four groups have also demonstrated diversity when considering which KPA is to be the least significant. Private sector respondents consider 'socioeconomic development' (SED) to be the least important KPA while public sector respondents perceived sustainability of partnerships (SP) to be the least significant. In other words, the public sector respondents seem to be more interested in the socioeconomic development potential of PPPs. Academics consider ‘construction and operation’ (CO) to be the least important: it is logical that an academic would be less concerned about the construction and operation of PPPs than about other more significant aspects from a political economy perspective—for example, the potential to contribute to enhanced socioeconomic development.

An acceptable and common explanation for the differences among the expert groups might be their different experiences and expectations, derived in part from working for the interest the different stakeholders. For example, a private sector respondent thinks that a profit motive is the main concern while a public sector expert puts an emphasis on the political purpose of the project, as guided by their political master.

Figure 5. 1: Weight ranges of the KPAs by different expert groups



PI: Planning and initiation; T: Tendering CO: Construction and operation; SP: Sustainability of partnerships F: Financing; TA: Transparency and accountability SS: Stakeholder satisfaction; SED: Socioeconomic development.
Source: Author

One-way ANOVA test

In order to test whether the variances of the mean weights assigned by different respondent groups to each of the KPAs are significantly different from a statistical standpoint, an F-test has been performed. A one-way repeated ANOVA reveals that there are no statistically significant differences among the four expert groups (private sector and public sector experts, finance experts and academics) when judging the relative importance of all the KPAs, except for 'financing' (F) and 'socioeconomic development' (SED). In the ANOVA test, F-values ranged from 0.450 (with p-value of 0.718) to 1.918 (p-value of 0.136) for a significance level of 0.05 for the remaining six KPAs (i.e., PI, T, CO, SP, TA and SS). However, for KPA 'financing' (F), the F-value (p-value 0.006) is 4.569 and for 'socioeconomic development' (SED), the F-value (p-value 0.020) is 3.525, (see table 5.4).

Table 5. 4: Results of ANOVA for financing and socioeconomic development

KPAs		Sum of Squares	df	Mean Square	*F*	*p*
(F) Financing	Between Groups	.098	3	.033	4.569	.006
	Within Groups	.457	64	.007		
	Total	.555	67			
(SED) Socioeconomic development	Between Groups	.072	3	.024	3.525	.020
	Within Groups	.438	64	.007		
	Total	.510	67			

Source: Author

As table 5.4 shows, the mean square differences between groups are larger than within groups for both KPAs, which implies that inter-group opinions are more diverse than intra-group opinions. This characteristic of stakeholder opinions is expected when comparing mean variances between groups, because different stakeholders prefer different levels of risk (Yuan et al., 2009).

The results of post hoc comparisons in table 5.5 further indicate which pair of the respondent groups is significantly different. Both private and public sector respondents weighted F as the most important KPA, while the respondents from financial bodies ranked it the second most important. These differences result from their perceptions, developed from their organisation's experience and perspective, of the relative importance of KPAs. Private and public sector experts understand better the challenges associated with financing PPP projects in the context of developing countries, where project closure and delays emerge from non-availability of appropriate funding arrangements (Mamun, 2015). Similarly, the private sector group differs from the financial expert group with respect to the relative importance of the KPA 'socioeconomic development' (SED)—with this KPA often being critical to political support for the PPP project.

Table 5. 5: Results of post hoc comparisons between groups using Tukey's HSD[2] method

Dependent Variable	**I**	**J**	**Mean Difference (I-J)**	**Std. Error**	***p***
(F) Financing	Private	Public	-.003	.028	.999
		Finance	**.072***	.026	.039
		Academics	.080	.038	.159
	Public	Finance	**.075***	.026	.024
		Academics	.083	.038	.127
	Finance	Academics	.008	.036	.996
(SED) Socio-economic development	Private	Public	-.037	.028	.554
		Finance	**-.081***	.026	.012
		Academics	-.028	.037	.874
	Public	Finance	-.045	.025	.301
		Academics	.009	.037	.995
	Finance	Academics	.053	.035	.432

* The mean difference is significant at 0.05 level
Source: Author

[2] Tukey's HSD (honestly significant difference) method is used to determine which means amongst a set of means differ from the rest.

5.3 Establishing weights for performance indicators of PPPs

5.3.1 Calculating and analysing the weights of indicators

As with the weights of KPAs, the weights of the eight groups of indicators (second level of the AHP hierarchy depicted in figure 4.2 in chapter 4), are first calculated independently, based on the pair-wise matrix derived for them from the collective judgments of all respondents. In this calculation, the AHP steps are followed systematically, finally establishing the global weights for indicators and sub-indicators (third level in the AHP hierarchy depicted in figure 4.2 in chapter 4) by combining the weights found for the KPAs/indicators/sub-indicators (Hossain, Guest, & Smith, 2018a). The pair-wise comparison matrix with normalised priority vectors for the eight groups of indicators and sub-indicators are presented in tables 5.6 to 5.15.

In KPA 'planning and initiation' (PI), the 'feasibility analysis' (FA) is assigned with the highest weight (priority vector) while the 'SMART objectives' are given the lowest weight, which means that the 'feasibility analysis' is the most important performance indicator in this group while the 'SMART objectives' are perceived to be the least significant (see table 5.6).

Table 5. 6: Pair-wise comparison matrix of planning and initiation (PI)

Level 2 Indicators	NA	SO	IA	FA	PIT	Normalised Priority vector
NA	1	1.8	7/8	3/5	1	0.1914
SO	5/9	1	6/7	3/7	1	0.142
IA	1.1428	1.1667	1	2/3	1.2	0.1957
FA	1.625	2.3333	1.4285	1	2	0.3081
PIT	1	1	5/6	1/2	1	0.1629

Notes:
NA—Needs Assessment; SO—SMART Objectives; IA—Implementability Assessment; FA—Feasibility Analysis; PIT—Public Interest Test.

Source: Author

In table 5.7, the weights of the indicators included in 'tendering' (T) are shown. The highest weight (0.2759) is received by the indicator SCM (selection criteria and method); the lowest (0.2310) in this group is received by ECS (efficient concessionaire section). As these weights suggest, the SCM is the most significant indicator while the ECS becomes the least significant in this group.

Table 5. 7: Pair-wise comparison matrix of tendering (T)

Level 2 Indicators	ECS	SCM	FT	SC	Normalised Priority vector
ECS	1	5/6	7/8	1	0.2310
SCM	1.2222	1	1	1.2222	0.2759
FT	1.1428	1	1	1	0.2564
SC	1	4/5	1	1	0.2368

Notes:
ECS—Efficient Concessionaire Selection; SCM—Selection Criteria and Method; FT—Fairness and Transparency; SC—Standarised Contract
Source: Author

In Table 5.8, the highest weight is assigned to the indicator Qa (quality of assets), with its associated score of 0.3155; the lowest score is assigned to TC (time consideration), with its corresponding score of 0.1504. As these weights suggest, the Qa is the most significant indicator while the TC becomes the least significant in this group.

Table 5. 8: Pair-wise comparison matrix of construction and operation (CO)

Level 2 Indicators	C	TC	Qa.	LCM	DS	Normalised Priority vector
C	1	1	3/5	2/3	1	0.1586
TC	1	1	1/2	1/2	1.1429	0.1504
Qa.	1.6667	2	1	1.8333	1.8889	0.3155
LCM	1.5	1.875	5/9	1	1.3333	0.2226
DS	1	7/8	1/2	3/4	1	0.1528

Notes: C—Cost Consideration; TC—Time Consideration; Qa.—Quality of assets; LCM—Life Cycle Maintainability; DS—Dispute Settlement.
Source: Author

In table 5.9, the indicator PrKS (private sector knowledge and skill) received the highest score (0.2050) and the indicator RD (relationship dilemmas) received the lowest score (0.0813) in this group, meaning that PrKS is the most important indictor and RD becomes the least important. In this group, all indicators seem very close to each another, with respect to their significance.

Table 5. 9: Pair-wise comparison matrix of sustainability of partnerships (SP)

Level 2 Indicators	TR	RD	PrKS	PuCC	PRR	PS	Normalised Priority vector
TR	1	2.75	3/4	4/7	4/7	2/3	0.1437
RD	3/8	1	3/7	4/9	5/9	4/9	0.0813
PrKS	1.3333	2.4	1	1.2857	1.1667	1	0.205
PuCC	1.7143	2.2222	7/9	1	1.25	1	0.195
PRR	1.75	1.8	6/7	4/5	1	5/6	0.1751
PrS	1.4444	2.25	1	1	1.2222	1	0.1999

Notes: TR—Trust and Respect; RD—Relationship Dilemmas; PrKS—Private Sector Knowledge and Skill; PuCC—Public Sector Capacities in Coordination; PRR—Partners roles and Responsibilities; PrS—Project Sustainability.

Source: Author

In Table 5.10, the indicator ORA (optimal risk allocation) received the highest score (0.2539) while the GL (government liabilities) received the lowest score (0.1523) in this group, meaning that ORA is the most important indicator and GL appears to be the least important.

Table 5. 10: Pair-wise comparison matrix of financing (F)

Level 2 Indicators	ORA	FC	PG	ORS	GL	Normalised Priority vector
ORA	1	1.75	1	1.3333	1.4286	0.2539
FC	4/7	1	1.2	1.25	1.2857	0.2025
PG	1	5/6	1	1.3333	1.8	0.2232
ORS	3/4	4/5	3/4	1	1	0.1681
GL	2/3	7/9	5/9	1	1	0.1523

Notes: ORA—Optimal Risk Allocation; FC—Financial Cost; PG—Payments and Government Guarantees; ORS—Optimal Revenue Sharing; GL—Government Liabilities.
Source: Author

The scores of the indicators included in KPA ‘transparency and accountability’ (TA) are shown in Table 5.11. The indicator LCEM (lifecycle evaluation and monitoring) becomes the highest scorer (with 0.3126) while the indicator DPI (disclosure of project information) turns out to be the lowest scorer with 0.1732. LCEM is therefore considered to be the most important indicator in this group while the DPI is least important.

Table 5. 11: Pair-wise comparison matrix of transparency and accountability (TA)

Level 2 Indicators	IL	DPI	LCEM	RC	Normalised Priority vector
IL	1	2.1429	3/4	2/3	0.2502
DPI	1/2	1	2/3	7/9	0.1732
LCEM	1.3333	1.5	1	1.5	0.3126
RC	1.5	1.2857	2/3	1	0.264

Notes: IL—Integration of Locals; DPI—Disclosure of Project Information; LCEM—Life Cycle Evaluation and Monitoring; RC—Responsiveness of Concessionaire.

Source: Author

Table 5. 12: Pair-wise comparison matrix of stakeholder satisfaction (SS)

Level 2 Indicators	PS	EUS	Normalised Priority vector
PS	1	1/2	0.3454
EUS	1.8889	1	0.6542

Notes: PS—Partners’ satisfaction; EUS—End user satisfaction.

Source: Author

‘Stakeholder satisfaction’ is divided into two parts: partner satisfaction (PS) and end user satisfaction (EUS). The EUS received the highest score (0.6542) while the PS received the lowest one (0.3454) (see table 5.12). In table 5.13, all sub-indicators included in the indicator PS (partner satisfaction) have very close scores to each other, except for ERM (efficient risk management), which received the highest score (0.3477). ERM is thus considered to be the most important sub-indicator in this group.

Table 5. 13: Pair-wise comparison matrix of partner satisfaction (PS)

Level 3 Sub-Indicators	MO	VFM	P	ERM	Normalised Priority vector
MO	1	5/6	1	3/5	0.2112
VFM	1.2	1	1.2	5/8	0.2377
P	1	5/6	1	5/8	0.2034
ERM	1.625	1.6	1.6	1	0.3477

Notes: MO—Meeting Objectives; VFM—Value for Money; P—Profitability; ERM—Efficient Risk Management.

Source: Author

In table 5.14, the scores of the sub-indicators included in the indicator EUS (end user satisfaction) are presented. 'Quality of service' (Qs) becomes the highest scorer in this group, followed by availability of service (0.3216) and economy of services (0.2168).

Table 5. 14: Pair-wise comparison matrix of end user satisfaction (EUS)

Level 3 Sub-indicators	E	A	Qs.	Normalised Priority vector
E	1	2/3	1/2	0.2168
A	1.5	1	2/3	0.3216
Qs.	2	1.5	1	0.4615

Notes: E—Economy of the Services; A—Availability of the Services; Qs—Quality of the Services.

Source: Author

Finally, table 5.15 presents the scores received by the indicators included in the KPA SED (socioeconomic development). The indicator ID (infrastructure development) received the highest score (0.2291) in this KPA while the indicator IPS (innovation in public sector) received the lowest score (0.1690). This means that the ID is the most important indicator and the IPS becomes the least important in this group.

Table 5. 15: Pair-wise comparison matrix of socioeconomic development (SED)

Level 2 Indicators	PSD	IPS	ID	EG	EF	Normalised Priority vector
PSD	1	1.1111	5/7	1	2/3	0.1748
IPS	8/9	1	5/6	5/7	5/6	0.169
ID	1.4	1.2	1	1.375	1	0.2291
EG	1	1.375	3/4	1	1	0.2011
EF	1.5	1.2	1.1111	1	1	0.226

Notes: PSD—PPP Sector Development; IPS—Innovation in Public Sector; ID—Infrastructure Development; EG—Employment Generation; EF—Environmental Friendliness.

Source: Author

Analysing indicators weights

Out of the forty-one, the top nineteen indicators—five from the KPA F, four from each of the three KPAs (TA, PI and T) and the remaining two from each of the two KPAs (CO and SS)—are initially taken into consideration for analysis. In particular, indicators with weights greater than the mean weight (>0.0246) are considered first (see table 5.16), followed by the list of the remaining sub/indicators (see table 5.17). As table 5.16 shows, 'feasibility analysis' (FA, with weight 0.051) is the most important indicator responsible, in developing countries such as Bangladesh, for assessing the performance of PPPs. This is followed, in order of the relative importance of the top ten indicators, by 'life cycle evaluation and monitoring' (LCEM, with 0.048), 'optimal risk allocation' (ORA, with 0.044), 'responsibility of concessionaire' (RC, with 0.041), 'payments and government guarantees' (PG, with 0.0389), 'integration of locals' (IL, with 0.0386), 'financial cost' (FC ,with 0.035), 'quality of assets' (Qa, with 0.0322), 'implementability assessment' (IA, with 0.0321), and 'quality of services' (Qs, with 0.032). The next nine indicators (in order of their weightings) include 'needs assessment' (NA, with 0.0310), 'selection criteria and method' (SCM, with 0.0297), 'optimum revenue sharing' (ORS, with 0.0296), 'fairness and transparency' (FT, with 0.0276), 'disclosure of project information' (DPI, with 0.0269), 'government liabilities' (GL, with 0.0268), 'public interest test' (PIT, with 0.0264), 'standardised contract' (SC, with 0.0255), and 'efficient concessionaire selection' (ECS, with 0.0248). These results suggest that the most important of the indicators in the developing countries context come from the key performance areas of 'financing', 'transparency and accountability', 'planning and initiation', and 'tendering'.

In table 5.17, the remaining indicators are listed. In this list, performance indicators such as cost, time and quality, which are considered to be the iron triangle[3] of measuring the success of a project in the developing country context, are perceived by our respondents to be significantly less important, and are accordingly placed at a lower level in the list, especially the cost and time indicators. They are considered to be only around two times more important than the least important indicator while the most significant indicator is 6.8 times more important than the least. Some other indicators, such as 'private sector knowledge and skill' (PrKS), 'public sector coordination capacity' (PuCC), 'value for money' (VFM) and 'profitability' (P), are also considered less important in the developing countries context. The indicators PrKS and PuCC are considered only 2.76 and 2.63 times more important respectively than the least important one; VFM and P seem to be very close to the least important indicator, with respect to their significance in evaluating PPP performance. These indicators are considered less significant in developing countries such as Bangladesh—most likely because they are

[3] See Atkinson, 1999 for the iron triangle of/for measuring the success of a project.

mostly related to an aspect of the efficiency of applying the PPP option, which seems to be more of a concern in advanced countries PPPs.

The consistency ratio (CR) and the geometric consistency index (GCI) calculated for each of the groups of respondents, and subsequently for all respondents, provide a value that is acceptable within the recommended limits for accepting the response of the respondents (see table 5.17). A CR value of less than 0.10 and a GCI value of less than 0.37 are recommended for n>4, where n is the number of dimensions of the matrix (Dong et al., 2010).

Table 5. 16: Mean weights (>0.0246) of 19 indicators

Indicators/sub-indicators	Public ($n = 18$) Weight *(Times more important***)*	σ	Private ($n = 17$) Weight *(Times more important***)*	σ	Financial ($n = 26$) Weight *(Times more important***)*	σ	Academics ($n = 7$) Weight *(Times more important***)*	σ	Overall ($n = 68$) Weight *(Times more important***)*	σ
(FA) Feasibility Analysis	0.0479*(8.71)*	0.0319	0.0553*(9.88)*	0.0551	0.0415*(5.39)*	0.0352	0.0667*(13.08)*	0.0393	0.0499*(6.82)*	0.0402
(LCEM) Life Cycle Evaluation and Monitoring	0.0310*(5.64)*	0.0222	0.0709*(12.66)*	0.0747	0.0416*(5.40)*	0.0366	0.0572*(11.22)*	0.0541	0.0485*(6.63)*	0.0515
(ORA) Optimal Risk Allocation	0.0769*(13.98)*	0.0636	0.0397*(7.09)*	0.0490	0.0341*(4.43)*	0.0298	0.0321*(6.29)*	0.0172	0.0447*(6.11)*	0.0481
(RC) Responsiveness of Concessionaire	0.0341*(6.20)*	0.0300	0.0506*(9.04)*	0.0336	0.0373*(4.84)*	0.0380	0.0483*(9.47)*	0.0131	0.0410*(5.61)*	0.0331
(PG) Payments and Government Guarantees	0.0388*(7.05)*	0.0188	0.0627*(11.20)*	0.0360	0.0303*(3.94)*	0.0227	0.0256*(5.02)*	0.0213	0.0393*(5.37)*	0.0272
(IL) Integration of Locals	0.0352*(6.40)*	0.0419	0.0325*(5.80)*	0.0484	0.0450*(5.84)*	0.0330	0.0458*(8.98)*	0.0287	0.0388*(5.31)*	0.0388
(FC) Financial Cost	0.0410*(7.45)*	0.0270	0.0471*(8.41)*	0.0392	0.0265*(3.44)*	0.0202	0.0307*(6.02)*	0.0189	0.0357*(4.88)*	0.0289
(Qa) Quality of Assets	0.0272*(4.95)*	0.0214	0.0366*(6.54)*	0.0461	0.0351*(4.56)*	0.0156	0.0159*(3.12)*	0.0107	0.0320*(4.38)*	0.0276
(IA) Implementability Assessment	0.0333*(6.05)*	0.0285	0.0373*(6.66)*	0.0438	0.0257*(3.34)*	0.0324	0.0290*(5.69)*	0.0256	0.0317*(4.33)*	0.0337
(Qs) Quality of the Services	0.0332*(6.04)*	0.0303	0.0316*(5.64)*	0.0427	0.0269*(3.49)*	0.0452	0.0329*(6.45)*	0.0268	0.0314*(4.29)*	0.0387
(NA) Needs Assessment	0.0341*(6.20)*	0.0404	0.0284*(5.07)*	0.0319	0.0300*(3.90)*	0.0599	0.0249*(4.88)*	0.0680	0.0310*(4.24)*	0.0495
(SCM) Selection Criteria and Method	0.0474*(8.62)*	0.0380	0.0223*(3.98)*	0.0125	0.0233*(3.03)*	0.0233	0.0314*(6.16)*	0.0226	0.0297*(4.06)*	0.0273
(ORS) Optimal Revenue Sharing	0.0322*(5.85)*	0.0188	0.0346*(6.18)*	0.0326	0.0244*(3.17)*	0.0136	0.0260*(5.10)*	0.0229	0.0296*(4.05)*	0.0218
(FT) Fairness and Transparency	0.0254*(4.62)*	0.0176	0.0283*(5.05)*	0.0127	0.0226*(2.94)*	0.0143	0.0505*(9.90)*	0.0608	0.0276*(3.77)*	0.0250
(DPI) Disclosure of Project Information	0.0237*(4.31)*	0.0297	0.0195*(3.48)*	0.0213	0.0267*(3.47)*	0.0269	0.0317*(6.22)*	0.0602	0.0269*(3.68)*	0.0321
(GL) Government Liabilities	0.0254*(4.62)*	0.0113	0.0326*(5.82)*	0.0288	0.0255*(3.31)*	0.0192	0.0180*(3.53)*	0.0129	0.0268*(3.66)*	0.0199
(PIT) Public Interest Test	0.0456*(8.29)*	0.0552	0.0166*(2.96)*	0.0350	0.0230*(2.99)*	0.0185	0.0247*(4.84)*	0.0186	0.0264*(3.61)*	0.0369
(SC) Standardised Contract	0.0276*(5.02)*	0.0211	0.0307*(5.48)*	0.0354	0.0182*(2.36)*	0.0134	0.0368*(7.22)*	0.0436	0.0255*(3.49)*	0.0269
(ECS) Efficient Concessionaire Selection	0.0267*(4.85)*	0.0302	0.0162*(2.89)*	0.0220	0.0285*(3.70)*	0.0519	0.0205*(4.02)*	0.0331	0.0248*(3.39)*	0.0393

Notes: * 'Times more important' shows how many times an indicator is important compared to the lowest weighted indicator (41th); n: Number of respondents; σ : Standard deviation.

Source: Author

Table 5. 17: Mean weights (<0.0246) of the remaining 22 indicators

Indicators/sub-indicators	Public ($n = 18$) Weight (*Times more important**)	σ	Private ($n = 17$) Weight (*Times more important**)	σ	Financial ($n = 26$) Weight (*Times more important**)	σ	Academics ($n = 7$) Weight (*Times more important**)	σ	Overall ($n = 68$) Weight (*Times more important**)	σ
(ID) Infrastructure Development	0.0209*(3.80)*	0.0224	0.0124*(2.21)*	0.0142	0.0289*(3.75)*	0.0221	0.0252*(4.94)*	0.0295	0.0235*(3.21)*	0.0217
(SO) SMART Objectives	0.0250*(4.55)*	0.0486	0.0220*(3.93)*	0.0174	0.0182*(2.36)*	0.0469	0.0356*(6.98)*	0.0163	0.0230*(3.15)*	0.0395
(LCM) Life Cycle Maintainability	0.0186*(3.38)*	0.0116	0.0267*(4.77)*	0.0319	0.0256*(2.32)*	0.0154	0.0104*(2.04)*	0.0179	0.0226*(3.09)*	0.0205
(A) Availability of the Services	0.0183*(3.33)*	0.0342	0.0184*(3.29)*	0.0140	0.0242*(3.14)*	0.0210	0.0253*(4.96)*	0.0630	0.0219*(2.99)*	0.0299
(EF) Environmental Friendliness	0.0157*(2.85)*	0.0292	0.0200*(3.57)*	0.0157	0.0258*(3.35)*	0.0441	0.0221*(4.33)*	0.0147	0.0206*(2.82)*	0.0328
(PrKS) Private Sector Knowledge and Skill	0.0163*(2.96)*	0.0093	0.0219*(3.91)*	0.0216	0.0208*(2.70)*	0.0231	0.0210*(4.12)*	0.0076	0.0202*(2.76)*	0.0186
(PSD) PPP Sector Development	0.0155*(2.82)*	0.0150	0.0069*(1.23)*	0.0195	0.0262*(3.40)*	0.0279	0.0215*(4.22)*	0.0176	0.0201*(2.75)*	0.0225
(PS) Project Sustainability	0.0133*(2.42)*	0.0125	0.0210*(3.75)*	0.0432	0.0239*(3.10)*	0.0264	0.0179*(3.51)*	0.0050	0.0197*(2.69)*	0.0285
(PuCC) Public Sector Capacities in Coordination	0.0186*(3.38)*	0.0109	0.0207*(3.70)*	0.0123	0.0182*(2.36)*	0.0170	0.0179*(3.51)*	0.0347	0.0192*(2.63)*	0.0170
(EG) Employment Generation	0.0190*(3.45)*	0.0226	0.0094*(1.68)*	0.0139	0.0287*(3.73)*	0.0430	0.0192*(3.76)*	0.0157	0.0179*(2.45)*	0.0315
(PRR) Partners roles and Responsibilities	0.0148*(2.69)*	0.0129	0.0221*(3.95)*	0.0117	0.0163*(2.12)*	0.0089	0.0130*(2.55)*	0.0093	0.0173*(2.37)*	0.0108
(C) Cost Consideration	0.0142*(2.58)*	0.0112	0.0098*(1.75)*	0.0094	0.0274*(3.56)*	0.0276	0.0061*(1.20)*	0.0182	0.0161*(2.20)*	0.0208
(DS) Dispute Settlement	0.0117*(2.13)*	0.0144	0.0118*(2.11)*	0.0161	0.0236*(3.06)*	0.0124	0.0084*(1.65)*	0.0032	0.0155*(2.12)*	0.0136
(T) Time Consideration	0.0151*(2.75)*	0.0155	0.0125*(2.23)*	0.0088	0.0206*(2.68)*	0.0166	0.0051*(1.00)*	0.0062	0.0153*(2.09)*	0.0145
(E) Economy of the Services	0.0126*(2.29)*	0.0087	0.0101*(1.80)*	0.0257	0.0191*(2.48)*	0.0251	0.0149*(2.92)*	0.0090	0.0148*(2.02)*	0.0206
(TR) Trust and Respect	0.0103*(1.87)*	0.0083	0.0131*(2.34)*	0.0092	0.0170*(2.21)*	0.0226	0.0162*(3.18)*	0.0147	0.0142*(1.94)*	0.0164
(IPS) Innovation in Public Sector	0.0165*(3.00)*	0.0117	0.0082*(1.46)*	0.0060	0.0230*(2.99)*	0.0103	0.0139*(2.73)*	0.0061	0.0129*(1.76)*	0.0102
(ERM) Efficient Risk Management	0.0080*(1.45)*	0.0092	0.0149*(2.66)*	0.0362	0.0130*(1.69)*	0.0150	0.0144*(2.82)*	0.0484	0.0125*(1.71)*	0.0257
(VFM) Value For Money	0.0100*(1.82)*	0.0074	0.0056*(1.00)*	0.0090	0.0077*(1.00)*	0.0039	0.0157*(3.08)*	0.0157	0.0085*(1.17)*	0.0084
(RD) Relationship Dilemmas	0.0070*(1.27)*	0.0102	0.0070*(1.25)*	0.0048	0.0097*(1.26)*	0.0122	0.0061*(1.20)*	0.0058	0.0080*(1.09)*	0.0098
(MO) Meeting Objectives	0.0065*(1.18)*	0.0054	0.0061*(1.09)*	0.0078	0.0080*(1.04)*	0.0092	0.0099*(1.94)*	0.0076	0.0075*(1.04)*	0.0078
(P) Profitability	0.0055*(1.00)*	0.0080	0.0060*(1.07)*	0.0121	0.0079*(1.03)*	0.0126	0.0115*(2.25)*	0.0159	0.0073*(1.00)*	0.0118
CR	0.028		0.099		0.022		0.079		0.03	
GCI	0.10		0.34		0.08		0.28		0.10	

Notes: *"Times more important" shows how many times an indicator is important compared to the lowest weighted indicator; n: Number of the respondents;
σ : Standard deviation; CR: Consistency ratio; GCI: Gross consistency index

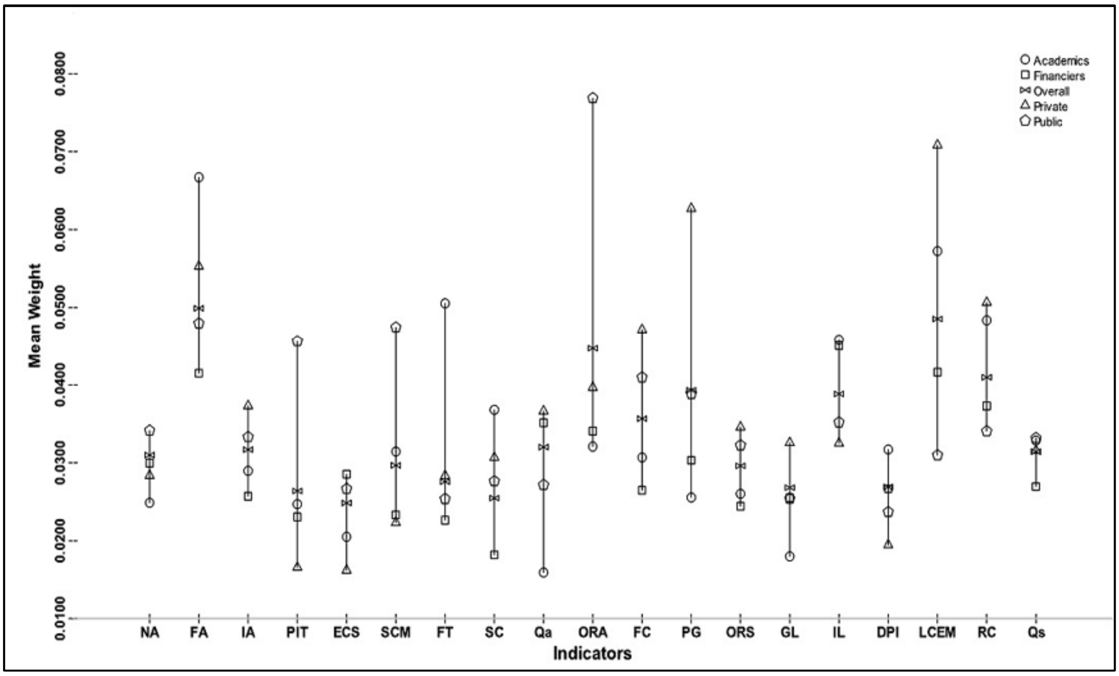
Source: Author

5.3.2 *Comparative analysis and ANOVA test*

Comparative analysis

For a comparative analysis, the indicators that have a mean weight greater than 0.0244 are considered. The rationale for choosing 0.0244 as the cut-off value is primarily because it is the average value of all weightings in the indicators (Yeung et al., 2012). Notable features of the results of the remaining indicators are also considered (see discussion of this result in sub-section 5.5.2) in order to draw an overall conclusion for this chapter. As shown in figure 5.2, all the expert groups assigned similar weights to eight indicators, with weights ranging from 0.027-0.033 to 0.018-0.033.

Figure 5. 2: Weights of top 19 indicators (mean >0.0244) by different expert groups



NA: Needs assessment; FA: Feasibility analysis; IA: Implementability assessment; PIT: Public interest test; ECS: Efficient concessionaire selection; SCM: Selection criteria and method; FT: Fairness and transparency; SC: Standardised contract; Qa: Quality of assets; ORA: Optimal risk allocation; FC: Financial cost; PG: Payments and guarantees; ORS: Optimal revenue sharing; GL: Government liabilities; IL: Integration of locals; DPI: Disclosure of project info; LCEM: Life cycle evaluation and monitoring; RC: Responsiveness of concessionaire; Qs: Quality of services.
Source: Hossain, Guest, & Smith, 2018a.

These eight include (from the lowest ranges) 'quality of assets' (Qs, with 0.027-0.033), followed by 'needs assessment' (NA), 'optimal revenue sharing' (ORS), ‘implementabiltiy assessment’ (IA), ‘disclosure of information’ (DPI), ‘efficient concessionaire selection’ (ECS), ‘integration of locals’ (IL) and ‘government liabilities’ (GL, with 0.018-0.033). The closeness of these ranges indicates that the expert groups have low differences of judgements when weighting these indicators. The height of the lines in figure 5.2 marks the range of the weights assigned by different groups for each of the indicators.

The next eight indicators, in terms of ranges of weights, comprise ‘responsiveness of concessionaire’ (RC), ‘standardised contract’ (SC), ‘quality of assets’ (Qa), ‘financial cost’ (FC), ‘selection criteria and method’ (SCM), ‘feasibility analysis’ (FA), ‘fairness and transparency’ (FT), and ‘public interest test’ (PIT). The weight ranges are from 0.034-0.051 to 0.017-0.046 for this group. To determine their relative weights, the experts have shown greater variability for this second group of indicators, compared to the first eight, which can be observed by the height of the lines in figure 5.2. For the weighting of the last group of three indicators, the experts have shown even further dispersion, ranging from 0.026-0.063 (for payments and government guarantees) to 0.032-0.077 (optimal risk allocation), and between them, LCEM (lifecycle evaluation and monitoring), whose range of weights is 0.031 to 0.071.

Public sector experts think that ‘optimal risk allocation’ (ORA) is the indicator with the highest weight when measuring PPP performance, followed by ‘feasibility analysis’ (FA), ‘selection criteria and method’ (SCM), ‘public interest test’ (PIT), and ‘financial cost’ (FC), among the top ten. By contrast, private sector experts weighted ‘lifecycle evaluation and monitoring’ (LCEM) as the most important, followed by ‘payments and government guarantees’ (PG), ‘feasibility analysis’ (FA), ‘responsiveness of concessionaire’ (RC), and ‘financial cost’ (FC). The finance experts assigned the highest weight to IL (integration of locals) followed by LCEM, FA, RC and Qa (quality of assets) among the top ten. The academics gave the highest weight to FA, followed by LCEM, FT (fairness and transparency), RC and IL.

One-way ANOVA test

An F-test was also performed to test whether the variances of the weights by respondent groups are significantly different for the highest-ranking indicators. A one-way repeated ANOVA test reveals that there are no statistically significant differences among the four expert groups when judging the relative importance for the top eighteen indicators (at the one percent significance level). The F values for these 18 ranged from 0.188 (with a P value of 0.904) to 3.592 (P value of 0.018) for a significance level of 0.01. However, statistically significant differences are found in weighting the indicator 'disclosure of project information' (with F (3, 64) = 4.393; P = 0.007), at the 0.01 significance level. At the 0.05 significance level, significant differences among experts are found in assigning weights to three indicators: 'public interest test' (PIT), 'selection criteria and method' (SCM) and 'life cycle evaluation and monitoring' (LCEM) (see table 5.18). The mean squares between groups are larger than within groups in the cases of all four indicators, which is normal (Yuan et al., 2009).

Table 5. 18: Results of the one-way ANOVA for PIT, SCM, DPI and LCEM

Indicators		**Sum of Squares**	**df**	**Mean Square**	***F***	***p***
(PIT) Public interest test	Between Groups	.177	3	.059	2.812	.046
	Within Groups	1.345	64	.021		
	Total	1.523	67			
(SCM) Selection criteria and method	Between Groups	.224	3	.075	3.592	.018
	Within Groups	1.333	64	.021		
	Total	1.557	67			
(DPI) Disclosure of project information	Between Groups	.197	3	.066	4.393	.007
	Within Groups	.955	64	.015		
	Total	1.151	67			
(LCEM) Lifecycle evaluation and monitoring	Between Groups	.286	3	.095	3.566	.019
	Within Groups	1.711	64	.027		
	Total	1.997	67			

Source: Author

Table 5. 19: Results of post hoc comparisons between groups using Tukey's HSD[4] method

Dependent Variable	(I)	(J)	Mean Difference (I-J)	Std. Error	*p*
(PIT) Public interest test	Private	Public	-.139*	.049	*.030*
		Finance	-.068	.045	*.437*
		Academics	-.036	.065	*.945*
	Public	Finance	.071	.044	*.387*
		Academics	.103	.064	*.387*
	Finance	Academics	.032	.062	*.954*
(SCM) Selection criteria and method	Private	Public	-.147*	.049	*.019*
		Finance	-.029	.045	*.918*
		Academics	-.036	.065	*.944*
	Public	Finance	.118*	.044	*.046*
		Academics	.111	.064	*.319*
	Finance	Academics	-.007	.061	*.999*
(DPI) Disclosure of project information	Private	Public	-.095	.041	*.106*
		Finance	-.056	.038	*.459*
		Academics	-.188**	.055	*.007*
	Public	Finance	.039	.037	*.719*
		Academics	-.092	.054	*.332*
	Finance	Academics	-.132	.052	*.064*
(LCEM) Lifecycle evaluation and monitoring	Private	Public	.158*	.055	*.029*
		Finance	.137*	.051	*.045*
		Academics	.045	.073	*.927*
	Public	Finance	-.021	.050	*.975*
		Academics	-.112	.073	*.416*
	Finance	Academics	-.091	.070	*.556*

At 0.05* and 0.01** level, the mean difference is significant
Source: Author

Table 5.19 shows the results of post hoc comparisons between groups. The results further represent which pair of groups has significant different judgements. On the indicators 'public interest test' (PIT), 'selection criteria and method' (SCM), and 'life cycle evaluation and monitoring' (LCEM), private sector respondents differ significantly from public sector respondents; for 'disclosure of project information' (DPI), the private sector differs significantly with academics. These differences might result from the

[4] Tukey's HSD (honestly significant difference) method is used to determine which means amongst a set of means differ from the rest.

different risk perceptions of the respondents. Ideally, academics are considered more risk neutral (Yuan et al., 2009) and should prefer a high level of disclosure of project information.

5.4 Reliability testing

An acceptable consistency ratio (CR) shows a reliability of the judgement made by the respondents. CR<0.10 is the recommended acceptability threshold in the standard case of pairwise comparisons (Saaty, 1990). In this study, the collective CR generated by all respondents is 0.03, which falls within the recommended range for this ratio, while the group-wise CR ranges from 0.02 to 0.10 (see table 5.20). The collective geometric consistency index (GCI) of 0.10 <0.37 (Dong et al., 2010) also confirmed the reliability of the transitive ordering of the preferences for our sample of respondents. Details of the CR and GCI values for each of the KPAs are provided in table 5.20. The small n shows the number of indicators in each of the KPA groups.

Table 5. 20: Summary of different reliability measures

KPAs	*n*	*RI*	*CR*	*GCI*
(PI) Planning and Initiation	5	1.12	0.010	0.030
(T) Tendering	4	0.90	0.002	0.007
(CO) Construction and Operation	5	1.12	0.009	0.034
(SP) Sustainability of Partnerships	6	1.24	0.014	0.051
(F) Financing	5	1.12	0.012	0.045
(TA) Transparency and Accountability	4	0.90	0.039	0.142
(SS) Stakeholder Satisfaction	2	0.00	0.001	0.000
(PS) Partner satisfaction	4	0.90	0.002	0.006
(EUS) End user satisfaction	3	0.58	0.001	0.003
(SED) Socio-economic Development	5	1.12	0.009	0.033

Notes:
n: Number of indicators in each KPA; RI: Random Index (Saaty, 1980); CR: Consistency Ratio; GCI: Gross consistency index; Recommended CR<0.10; GCI<0.37for n>4 (Dong et al., 2010)
Source: Author

5.5 Critical discussion of the results

5.5.1 KPAs of PPPs in developing countries

To the best of our knowledge, no study has previously determined weights for the key performance areas (KPAs) of PPPs in the context of the developing countries, including Bangladesh, using an AHP approach. This study has successfully applied the AHP method in establishing weights for the eight KPAs and their related indicators. In this section, a critical discussion has been made on results relating to these KPAs.

Of the leading three KPAs, 'financing' (F) and 'transparency and accountability' (TA) are considered together for discussion, followed by 'planning and initiation' (PI). First, the importance of KPA F can be observed by the case of the Elevated Expressway in Bangladesh, where three deadlines were missed in starting construction (Mamun, 2015). Failure to arrange the required funding delayed project completion and thus affected the perceived performance of PPPs in Bangladesh. Lack of timely finance for a PPP project, which becomes more obvious in developing countries than in developed ones, greatly affects the actual outcome of the PPPs (Chong & Poole, 2013). Developing countries have a huge investment gap for infrastructure development, and only 20 percent of the infrastructure investment demand is fulfilled by private participation (Ruiz-Nuñez & Wei, 2015). This also signals that the availability of financing is generally a critical issue in developing countries, including Bangladesh.

TA in Bangladesh is also considered to be a relatively critical KPA, for it has an association with the governance qualities that impact on PPP performances. Bangladesh shares these qualities with other developing countries in the region, especially in South Asia. Earlier studies recognized that institutional qualities attract the private sector to invest into PPPs, resulting in better performance in developing countries (Hammami et al., 2006; Panayides et al., 2015). Similarly, PI has been perceived to be significant by our respondents because of its link with poor planning and erroneous project selection, which might have an impact on performance. The World Bank (2017) reported that weak planning failed to achieve good value for money in a Mumbai water infrastructure project in India, a developing country like Bangladesh. Likewise, rating 'tendering' (T), as the fourth KPA, indicates its relatively higher importance in the Bangladesh context.

The KPAs relating to 'stakeholder satisfaction' (SS), 'socioeconomic development' (SED) and 'sustainability of partnerships' (SP) appear to be relatively less important in Bangladesh, probably because they are considered issues that are more pertinent to PPPs in developed countries Previous research acknowledged that some issues (relating to these KPAs), such as stable risk allocation, designing robust business cases and effective control on concessionaire arrangements, are considered priority issues for developed countries (De Jong et al., 2010). Relationship management in developed countries is also more focused on maintaining sustainable partnerships in order to attain superior value from PPPs (Zou et al., 2014). 'Construction and operation' (CO) is the phase where outcomes begin to be generated and where an efficient bundling and contract design will have an impact on such results. Clearly, designing and bundling are capacity issues that require a high level of expertise, which the only developed countries might have the luxury of demanding. Because of this, respondents in Bangladesh have perceived the CO KPA to be less significant.

5.5.2 Performance indicators of PPPs in developing countries

The most significant top ten indicators include 'feasibility analysis' (FA), 'life cycle evaluation and monitoring' (LCEM), 'optimal risk allocation' (ORA), 'responsiveness of concessionaire' (RC), 'payments and government guarantees' (PG), 'integration of locals' (IL), 'financial cost' (FC), 'quality of assets' (Qa), 'implementability assessment' (IA), and 'quality of services' (Qs), although the remaining indicators are not insignificant. But their relative importance differs across different countries. Country-specific differences in experience with these indicators might lead to the variances in their relative significance. As a result, our discussion will focus on why these indicators are significant in the context of Bangladesh, and will relate these causes to similar studies previously published regarding the developing countries.

FA holds the highest overall weighting, which implies that it is the most significant indicator of PPP performance in Bangladesh, where a number of mega projects were cancelled, renegotiated or stalled, largely because of the absence of a detailed feasibility study. An example of a cancelled project is the Shah Amanat International Airport, the contract for which was signed in 2005, but was subsequently cancelled in 2007 (ADB, 2017). Lack of rigorous feasibility analysis in the project planning stage of the Dhaka Elevated Expressway was also reported to be the main cause of delay in reaching financial closure. Earlier research supported these findings that the FA has a link with schedule performance, and is generally associated with better service performance of developing countries' PPPs (Almarri & Boussabaine, 2017).

LCEM is a recent concept (as a performance indicator) in PPP performance evaluation, even in the developed countries (Love et al., 2015). For Bangladesh, it is difficult to tell why the LCEM is rated as one of the most important indicators. However, the life cycle perspective of PPP projects is essential for all countries, irrespective of their development status. Over the longer term, a phase-based evaluation and monitoring process that passes through a phase of 'learning by doing' is critical for making a PPP project successful in Bangladesh. Lessons learnt from this phase need to be calibrated for improved outcomes related to PPP performance. For achieving better value for money, operating and maintenance costs in every phase of the project need to be reviewed periodically, with corrective actions taken as required (Love et al., 2015).

Our respondents perceived ‘optimal risk allocation’ (ORA) as important for PPPs in Bangladesh because projects implemented in this manner require a complex analysis of risk from the perspectives of the different stakeholders. Bangladesh lacks this sort of skilled expertise, at least in the public sector, as indicated by the perception (weights) of the respondents in the public sector group (see table 5.16). PPP experts in Bangladesh are yet to acquire this skill. Optimism bias and corruption in Bangladesh might encourage allocating risk sub-optimally and taking advantage of opportunistic contract cancellation and renegotiation. Previous studies (Ameyaw & Chan, 2015; Percoco, 2014) also supported this result in other developing countries.

The ‘responsiveness of the concessionaire’ (RC) is an accountability concern that is fairly common in the developing countries, including Bangladesh, where holding concessionaires accountable to their commitments suffers from strict enforcement of contract terms. However, flexibility in enforcing contract terms might encourage concessionaires to be unresponsive to the local needs and demands that relate to the services and promises made by the project. So RC is placed by our respondents in the top ten performance indicators in Bangladesh. ‘Payments and government guarantees’ (PG) is also considered an important indicator: sponsors anticipate a higher uncertainty on revenue flows from projects in Bangladesh, which makes PPP projects difficult to be commercially viable. Implementation guarantees and security packages provided by the government have resulted in better performances of some early implemented power projects in Bangladesh (M. Khan et al., 2012).

Bangladesh has a small geographic area that is heavily populated and with limited usable land that is in high demand. Implementing PPP projects often requires the need to acquire land or free it from the existing occupants. In cases where locals have not been included in the process of project implementation by offering them incentives or counselling measures, disputes arise, and thus 'integration of locals' becomes an issue that can impact negatively on project performance. Integrating locals to implementing PPP projects has also been found to be an important indicator (Osei-Kyei & Chan, 2017b).

'Financial cost' is also a significant criterion that might influence PPP performance (as perceived by our respondents). Lending by local banks to long-term investment associated with PPP projects in Bangladesh might act to crowd-out private investment and make financing more expensive. Similar evidence was recorded in a study on barriers to PPPs in Nigeria, where financing PPPs suffered from a scarcity of long-term financing arrangements (Babatunde, Perera, Zhou, & Udeaja, 2015). Quality of assets and of services (the 8th and 10th indicators) in Bangladesh could be linked to the institutional qualities in the public sector and to the innovative skill characteristics more normally associated with the private sector. Output specifications that include these qualities were also found to be significant in other developing countries (Osei-Kyei & Chan, 2017a). 'Implementability assessment' is also important, probably because Bangladesh has constrained resources and has political risk that becomes significant in a transition of power to a different political party.

Also above the mean weight (>0.0246), after the top ten indicators, are other indicators: 'needs assessment' (NA), 'selection criteria and method' (SCM), 'optimal revenue sharing' (ORS), 'fairness and transparency' (FT), 'disclosure of project information' (DPI), 'government liabilities' (GL), 'public interest test' (PIT), 'standardised contract' (SC) and 'efficient concessionaire selection' (ECS) (see table 5.16). This implies that they are significant as well, but have a lesser degree of impact on the performance measurement. SCM, FT, DPI and ECS are associated with the process of concessionaire selection, its transparency and ultimately its governance qualities. Bangladesh, as a developing country, possesses poor governance qualities that might lead our respondents to perceive these indicators to be significant ones. While NA, ORS, GL, PIT and SC all are broadly linked with the skill of the analyst responsible for assessing these aspects, GL and PIT are also associated to some extent with political commitments. The ability of PPP facilitators in Bangladesh is increasing, but there is scope for it to improve further, although the political commitments are weak and are not anticipated to improve.

Besides these nineteen indicators, others such as cost, time, profitability, value for money, private sector expertise and public sector capacities, and dispute settlement are commonly perceived as the leading PPP performance indicators in both developed and developing countries (Raisbeck et al., 2010). However, they are positioned, in the case of Bangladesh, in the lower level of importance weightings. This can be explained by reasons specific to these indicators. The lower importance assigned to cost and time indicators could be caused by a higher scope for opportunistic renegotiation to allow private partners to offset losses incurred due to cost overrun and time delays, as evident in transport PPPs (N. Islam, 2015). Indicators such as private sector expertise and public sector capacities could be linked to the poor competitive environment that prevails in Bangladesh. An assessment of the value for money indicator depends on the cost components of a PSC analysis, which is not often conducted in Bangladesh. The scope for rent capture, and a strong network of private partners with the government (M. Khan et al., 2012), generates less concern about project’s profitability than about winning the PPP project contract.

5.6 Concluding remarks

In this chapter, the relative importance (weights) of performance indicators and KPAs of PPPs in developing countries has been established by using the AHP method. A set of different performance indicators including, for example, ‘feasibility analysis’ (FA), ‘lifecycle evaluation and monitoring’ (LCEM), ‘optimal risk allocation’ (ORA) and ‘responsiveness of concessionaire’ (RC), are found to be dominant in the developing countries context; ‘financing’ (F), ‘planning and initiation’ (PI) and ‘transparency and accountability’ (TA) are perceived as leading KPAs. Why the leading KPAs and indicators in the developing countries are different from the developed countries has been discussed. The next chapter, which presents a case study exploring the performance areas of the power sector PPPs in Bangladesh, finds differences in the outcomes resulting from using these two different evaluation approaches—the traditional way of case analysis and the KPA system.

Chapter Six: Case studies of power PPPs—

an analysis of project experiences

6.1 Introduction

This chapter addresses research question 3: what are the most important performance areas of the power sector PPPs in Bangladesh using a traditional approach of analysing case experiences? To facilitate the traditional approach of case analysis, a conceptual framework of the pathway of PPP performance and the concept of a sustainable energy system are used (Section 6.2). Details of the six cases, including the project outcomes in relation to the KPAs, are critically discussed, along with an analysis of and discussion of the findings in this chapter (Section 6.3 and 6.4).

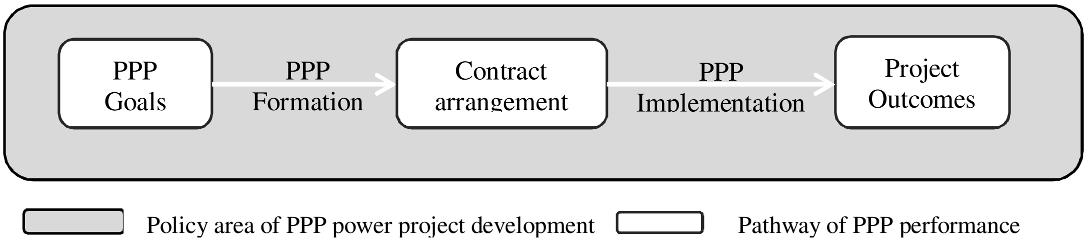
6.2 Framework of PPP performance

6.2.1 Pathway framework of PPP performance

A conceptual framework of the pathway of PPP performance was illustrated by Wang & Zhao (2018) (see figure 6.1). In the figure, the grey space represents the policy area of the PPP formation and PPP implementation, which relate to ideological, legal and organisational contexts. These contextual factors ideally regulate partnership formation, implementation, and contract negotiation. Accordingly, they are expected to have an influence on PPP performance (Wang & Zhao, 2018). The two phases in the policy area comprise PPP formation and PPP implementation, with these areas connected through partnership contracts. At the beginning of the pathway, PPP development starts with setting goals for the PPP project, and then passes through reaching the contractual agreements that guide PPP implementation (Baker, 2016; Wang & Zhao, 2018). A detailed contractual arrangement helps protect the goals of the project and acts to guide implementation effectively, which will have a significant impact on the project outcomes (Van Den Hurk & Verhoest, 2016). Project performance is first evaluated by first aligning project outcomes with the goals set initially and afterwards with contractual arrangements

(Wang & Zhao, 2018). The project outcomes are subsequently evaluated in relation to the key performance areas (KPAs) identified and discussed in chapter 2 (literature review).

Figure 6. 1: Conceptual framework of pathway of PPP performance



Source: Adapted from Wang & Zhao, 2018.

Policy area

The policy area focuses mainly on creating an enabling environment through legal and institutional support for PPP formation, implementation and operation (Wang & Zhao, 2018). An effective and supportive policy could reduce risk and increase the likelihood of success to PPPs (Grimsey & Lewis, 2007). Important policy documents of the Bangladesh government relating to PPP power projects through private participation include 'Private Sector Power Generation Policy 1996', 'Private Sector Infrastructure Guidelines 2004', 'Vision Statement & Policy Statement on Power Sector Reform 2000', and 'Policy Guidelines for Enhancement of Private Participation in the Power Sector 2008' (Power Division, 2018). These policy documents dictate the rationale, objectives and action plans for implementing PPP power projects by the government of Bangladesh (Power Division, 1996, 2008, 2016). They are used as the foundation for constructing a framework for evaluating the performance of power sector PPPs.

PPP goals

Reviewing government policy documents and related publications suggests some specific goals that could be achieved by adopting PPP power projects through the private sector (Power Division, 1996, 2008, 2016). Following the pathway of PPP performance in figure 6.1, a performance framework for evaluating the PPP power projects selected in this case study has been constructed (see table 6.1) based on policy guidelines related to PPP power projects and the concept of the sustainable energy system (see sub-section 6.2.2 for details). In addition to the policy documents, the existing literature on PPP power projects in the context of developing countries has also been reviewed to support the construction of the performance framework for this case study approach.

Table 6. 1: Framework of performance evaluation of power PPPs

Performance area	Attributes
Improving power supply	Ability to provide electricity to more people
Promote private participation	Support private sector to be engaged in power generation
Local entrepreneurship development	Promoting local entrepreneurs to be involved in investing power sector
Innovative financing	Out of the box financial arrangement for power sector projects
Local capital market development	Contributing to developing local equity and debt capital market
Harness competition	Transparent and accountable process of concessionaire selection
Fuel diversification	Reducing dependency on gas and using an alternative fuel source
Fair and competitive tariffs	Balancing between competitive tariffs and affordability of consumers
Efficiency gains	Achieving optimal values from using limited resources
Risk transfer	Shifting construction and other risks to private participants

Source: Power Division, 1996, 2004, 2008, 2016.

Security packages or contractual arrangements

The policy elements extracted from the related documents from the 'policy area' section, together called a 'security package', include a number of contract agreements and other privileges offered to private sector investors. These contract agreements include an implementation agreement (ImA), a power purchase agreement (PPA), a fuel supply agreement (FSA), and a land lease/acquisition agreement (LLA). The ImA provides guarantees for an adjustment of certain tariff components as a result of variations in the exchange rate, fuel prices, and inflation rate. The PPA provides the guarantee of produced power to be purchased by a single buyer (namely the BPDB). Under the FSA, fuel supply is guaranteed by the Government of Bangladesh (GoB) in the cases where the supplier is a public sector organisation. The required land for the project is provided either by state-owned organisations through lease arrangements, or is acquired directly by the government, or is directly purchased by the sponsors, depending on the provision of the LLA (Power Division, 1996, 2008, 2016). Furthermore, there are exemptions from corporate income tax for the private power companies for a period of 15 years. Repatriation facilities for invested capital, profits and dividends are provided; local currency (Taka) is convertible for international payments on the current account (Power Division, 1996; World Bank, 2015).

Project outcomes

Project outcomes are the ultimate performances or achievements that occur because of the collaborative activities in PPP implementation governed by the contractual arrangements (Wang & Zhao, 2018). These performances are evaluated by aligning them with the goals of the projects revealed during the formation of PPP. This is a traditional way of evaluating the performances of the power sector PPPs. The actual project outcomes are also evaluated by aligning them with the KPAs, and the differences in the outcomes derived from using two different approaches are discussed.

6.2.2 Concept of a sustainable energy system

The concept provided by Boston (2013) of a sustainable energy system consists of three aspects: energy security, affordability, and environmental sustainability. Achieving a trade-off between these aspects is needed to ensure a sustainable energy system because they are interrelated (Atmo & Duffield, 2014; Boston, 2013). The goal of the government is to provide affordable and reliable electricity to all, by 2021, without compromising environmental sustainability. These three aspects are integrated with the goals revealed in the government policy documents and are considered when evaluating the performance of the selected projects.

6.3 Presentation of case studies

6.3.1 360MW Haripur Power Ltd (HPL)

Background of private sector power generation

Before presenting the Haripur Power Limited (HPL) case, some background on the power sector of Bangladesh is needed. In the late 1990s, the power sector in Bangladesh experienced a number of difficulties such as severe power shortages, poor services to the existing limited customer base, unrecorded consumption, low tariff rates, low bill recovery levels (i.e., 80 percent of the bills) and the high level of system losses (World Bank, 2000a, 2014a). The sector at that time had an available capacity of 2400MW power supply, the net of the installed capacity of 3200MW. With this supply, only 15 percent of the total population had access to electricity services. Given this background, along with rapidly increasing electricity demand and shortages of public sector investment in this sector, the government called on private sector investors to become involved (World Bank, 2014a).

Objectives of HPL

The HPL was developed with the objectives of (a) alleviating power shortages in a cost-effective and reliable manner; (b) saving of millions of dollars by replacing diesel-based power generation projects that also have adverse environmental impacts; and (c) mobilising private sector investments in developing power projects. These objectives were to assist the government to reduce its budgetary gap and to enable the undertaking of new power projects (World Bank, 2014a).

Key information on the HPL

The HPL, the first independent power producer (IPP), was built by the AES (Applied Energy Services) of United States under the name of Haripur Power Ltd that was incorporated in Bangladesh. Details of this project information are presented in table 6.2.

Table 6. 2: Profile of Haripur Power Limited

1	**Project milestones/phases:**	**Date estimated:**	**Date achieved:**
	Date tender calling	NA	June/1997
	Contract signing (ImA/PPA/GSA/LA)	NA	Sept/1998
	Construction begins	NA	Nov/1999
	Year financial closure	June/2000	April/2001
	Commercial operation date (COD):	Dec/2001	June/2001 (Simple Cycle) Dec/2001 (Combined Cycle)
2	**Project information:**		
	Installed capacity (MW)	360 MW	
	Generation capacity (MW)	360 MW	
	Fuel type/technology	Natural Gas	
	Total investment	US$ 183 Million	
	Concession period	22 Years	
	Contract type	BOO (Build, Own and Operate)	
	Sponsor/developer	AES (USA) (Original); Pendekar Energy (Malaysia) (Current)	
	Project status	Operational	
	Buyer type	Single buyer (BPDB)	
	Contracted levelised tariff	US cents 2.73/kWh	
	Tariff structure	Capacity (Payment for fixed cost); Energy (Payment for fuel + O & M (variable)	
	Contribution to total generation	10% (Commissioning time) 4% (2017)	
	Government control	Line ministry (MPEMR, Central Govt.)	
3	**Project attributes/features:**		
	Implementation agreement (ImA, with MPEMR)	MPEMR guaranteed construction on site and compliance to PPA, GSA and LLA	
	Power purchasing agreement (PPA, with BPDB)	BPDB is the single off-taker of the energy output	
	Gas supply agreement (GSA, with Titas)	Titas is the state owned gas supplier	
	Land lease agreement (LLA with Ministry of Industries)	Ministry of Industries provided land for the contract term	
	Indemnity agreement (Between government and IDA)	Government guaranteed IDA for resolving any non-compliance of ImA/PPA/GSA/LLA	
	Procurement method	Competitive tendering	
	Number of bidders	12 sponsors submitted unsolicited bids—6 were issued RFP—4 dropped tenders	

Notes:
BPDB—Bangladesh Power Development Board; MPEMR—Ministry of Power, Energy and Mineral Resources; O & M—Operation & Maintenance; GSA—Gas Supply Agreement; RFP—Request for Proposal; IDA—International Development Association
Source: Islam, 2015; World Bank, 2000a, 2000b, 2014.

The HPL, one of the early IPPs in Bangladesh, won the contract through a competitive bidding process related to developing the project on a BOO basis, with a concession period of 22 years. This plant is located 24 km southeast of the capital city (Dhaka) in a power hub for the country.

Financing, guarantees, and agreements

The US$ 183 million project was initially financed by equity (US$ 68 million), by an International Finance Corporation (IFC) loan (US$ 54 million) and by a commercial bank loan (US$ 60.9 million). The commercial loan was backed by International Development Association (IDA) partial risk guarantees (PRG) on a security structure supported by the government guarantees (World Bank, 2015). Details of the project cost and its financing structure are presented in table 6.3.

Table 6. 3: Estimated cost and financing structure of Haripur Power Limited

a) Project cost	**Estimate (US$ million)**	**Actual (US$ million)**	**Percentage**
Cost components:			
EPC (Engineering procurement and construction)	124.00	124.00	100
Other construction	22.00	19.60	89
Development cost	8.00	8.00	100
Contingencies	5.00	0	0
Financing cost	3.00	3.00	100
IDC (Institutional Development Credit)	12.00	12.00	100
Debt servicing reserve account	9.00	9.00	100
Total estimated cost	**183.00**	**175.60**	**96**
b) Financing structure			
Equity	76.7	73.7	96
Senior sponsor facility/FMO	37.0	37.0	100
Subordinated sponsor loan [a]	8.4	8.4	100
IDA (International Development Association) guaranteed commercial loan	60.9	60.9	100
Total	**183.0**	**175.6**	**96**
Debt-equity	**54:46**	**54:46**	

Note: [a]Subordinated sponsor loan is part of the equity; FMO—The Netherlands Development Finance Company

Source: World Bank, 2014.

The government guarantees include some important agreements about the state rights and obligations of the participating parties in the project. The agreements signed by the project company and the different government agencies were: (a) an Implementation Agreement (ImA) with the Ministry of Power, Energy and Mineral Resources (MPEMR); (b) a Purchasing Agreement (PPA) with Bangladesh Power Development Board (BPDB); (c) a Gas Supply Agreement (GSA) with Titas

Transmission and Distribution Company Ltd; and (d) a Land Lease Agreement (LLA) with the Ministry of Industries (World Bank, 2000b).

Commercial operation date (COD), tariff and others

The project achieved a commercial operation date (COD) for the simple cycle component in June 2001 and for the combined cycle component in December 2001. The tariff rate for this project was US$ 0.0273, the lowest IPP tariff ever in Bangladesh and one of the lowest to date in the world (Azad, 2002; World Bank, 2014a). This first IPP was reported to be successful mainly because of the direct involvement of the World Bank and other international funding agencies: they contributed to an effective and fair procurement process which resulted in lowering the cost of capital (M. Khan et al., 2012). This ultimately led to the lowest cost of per kWh in both the IPP and public sector generation sector (Bhattacharya & Tahsina, 2008; M. Khan et al., 2012). See figure 6.2 for an image of the project in full operation.

Figure 6. 2: Image of the Haripur Power Limited

Source: Islam, 2015.

AES sold its IPP assets in Bangladesh, including the HPL, to CDC (Commonwealth Development Corporation) Globeleq in 2005, and then Golbeleq resold them to Pendekar Energy, a joint venture between Malaysian Tanjong Energy and Saudi

Aljomiah, in 2007. Both AES and CDC Globeleq sold their businesses in Bangladesh as a part of their relocation strategy (World Bank, 2000b, 2014a)

Risk allocation

Table 6.4 shows the risks associated with the project, which were allocated to the private sector (sponsor and lender) and the government.

Table 6. 4: Risk allocation matrix of Haripur Power Limited

Risk type	Private sector (Sponsor and lender)	Government
Pre-construction:		
Design	○	
Debt-equity financing	○	
Construction:		
Cost overruns	○	
Schedule delays	○	
Operation:		
Operation and maintenance	○	
Output quality specification	○	
Fuel supply availability		○
Fuel supply prices		○
Tariff payment		○
Concession term:		
Currency devaluation		○
Currency convertibility and trans		○
Political force majeure		○
Prevention of dispute resolution through arbitration		○
Changes in laws		○
Expropriation		○
Land lease		○
Natural force majeure relating to project	○	
Natural force majeure relating to gas supply and pipeline		○
Demand accuracy		○
Regulatory risk		○

Source: World Bank, 2000a, 2014.

This risk allocation was designed by the World Bank (IFC) particularly for the HPL when they provided loans and guarantees to this project. However, this model was later used in most of the IPP projects in Bangladesh, including the selected IPPs described in this study, with some negotiated modifications. These modifications are listed in the descriptions of the respective project sections.

Outcomes in relation to KPAs

As described previously, the KPAs of PPPs (detailed in chapter 2) are built on the performance indicators identified by the review of related literature and assigned with weightings developed by using the AHP (in chapter 5).

Although these KPAs are based on different sectors, the performance areas (objectives) of the power sector PPPs have relevance to these KPAs, since the PPPs have some common performance objectives, irrespective of specific sectors. Hence, the KPAs are considered useful for making a comparative analysis of the project actual outcomes. The actual outcomes are built on objective information extracted from the description of the cases. The eight KPAs, including ‘planning and initiation’ (PI), ‘tendering’ (T), ‘construction and operation’ (CO), ‘sustainability of partnerships’ (SP), ‘financing’ (F), ‘transparency and accountability’ (TA), ‘stakeholder satisfaction’ (SS), and ‘socioeconomic development’ (SED), are used in the analysis.

The performance outcomes of the HPL, presented in table 6.5, give objective information on the performance measures related to each of the KPAs. In light of the KPA system, the performance outcomes in six KPAs seemed to be fulfilled; they were partially achieved in two areas: transparency and accountability and socioeconomic development areas. The life cycle issue of transparency and accountability is a recent phenomenon in PPP performance evaluation; the long-term benefits (or costs) in relation to socio-economic development are difficult to be determined.

Table 6. 5: Outcomes of the HPL in relation to KPAs

KPAs	Outcomes	Objective notes
Planning and initiation	✔	This project was well planned and supported by the government and was developed by an experienced international sponsor (Applied Energy Services)[a].
Tendering	✔	A competitive tendering process was used to select the sponsor and 12 bids were submitted.
Construction and operation	✔	Completed on-budget and 6 months ahead of the target schedule for a simple cycle plant, and the operation of the life cycle of the project seemed to be smooth without any major difficulties.
Sustainability of partnerships	✔	Fostered successful partnership during last 17 years without major disputes reported.
Financing	✔	Arranged International Finance Corporation (IFC) loan of US$ 54 million, international commercial bank loan of US$ 60.9 and sponsor equity of US$ 68 million.
Transparency and accountability	ϕ	The initial procurement of the project was transparent, but the life cycle transparency and accountability was unclear since information on this was unavailable.
Stakeholder satisfaction	✔	Lowest tariffs (US cents 2.76/Kwh), contribution to power generation (4 percent in 2017), and an ideal project for references etc. were some of the satisfying factors.
Socio economic development	ϕ	Contributed to the long-term economic development by generating power and employment, but it is difficult to conclude on the full consequences with respect to this KPA without more extensive empirical analysis.

Notes: ✔ Performance achieved; ϕ Performance partially achieved. [a] (M. Khan et al., 2012; World Bank, 2014a)

Source: Author

6.3.2 110MW Khulna Power Company Ltd (KPCL)

The KPCL had a special purpose (along with the purposes stated in the background of the HPL) of supplying electricity in the south-western part of the country and in the industrial and economic zone in this area (Dhaka Stock Exchange, 2010).

Key information on KPCL

Table 6.6 presents details for the KPCL. It is one of the early generation IPPs developed in 1997 by a consortium led by the Coastal Power Corporation (later merged with El Paso, United States) and Wartsila Corporation of Finland, along with two local conglomerates (Summit Group and United Group) (KPCL Annual Report, 2017). Both El Paso and Wartsila were internationally reputed corporations. Although the KPCL was a private limited company at the time of its formation, it was converted in 2009 into a public limited company (Dhaka Stock Exchange, 2010). KPCL has two other subsidiaries, namely the Khulna Power Company Unit II Ltd (KPCL-II) and the Khanjahan Ali Power Company Ltd (KPCL-III) that are located in close proximity to it. In 2015, both of these subsidiaries were merged with KPCL. At present, the Summit Group and United Group have acquired all the shares (73.9 percent) of the foreign partners; the foreign companies sold their shares because they were transferring their business from south Asia as a global repositioning strategy (Dhaka Stock Exchange, 2010; KPCL Annual Report, 2009).

Table 6. 6: Profile of the KPCL

1	**Project milestones/phases:**	**Date estimated:**	**Date achieved:**
	Date tender calling	NA	--
	Contract signing (ImA/PPA/GSA/LA)	NA	Oct/1997
	Construction begins	NA	--
	Year financial closure	--	Aug/1998
	Commercial operation date (COD):	Oct/1998	Oct/1998
2	**Project information:**		
	Installed capacity (MW)	114 MW	
	Generation capacity (MW)	110 MW	
	Fuel type/technology	Heavy Fuel Oil (HFO)	
	Total investment	US$ 103 Million (estimated)	
	Concession period	15 Years, renewed up to 2018	
	Contract type	BOO (Build, Own and Operate)	
	Sponsor/developer	El Paso (USA)/Wartsila (Finland)/Summit/United (BD) Summit/United (Bangladesh) (Current)	
	Project status	Operational	
	Buyer type	Single buyer (BPDB)	
	Contracted levelised tariff	US cents 5.83/kWh	
	Tariff structure	Fuel Tariff (Cost of fuel); Other Monthly Tariff (For operation, maintenance and capacity payment)	
	Contribution to total generation	0.72% (2017)	
	Government control	MPEMR (Line ministry)	
3	**Project attributes/features:**		
	Implementation agreement (ImA, with MEMR)	MEMR guaranteed construction on site and compliance to PPA, and LLA	
	Power purchasing agreement (PPA, with BPDB)	BPDB is the single off-taker of the energy output	
	Fuel supply	HFO is imported by the project company (Price changes are adjusted time to time)	
	Land lease agreement (LLA with BPDB)	BPDB provided 4.7 acres land	
	Indemnity agreement	Not available	
	Procurement method	Competitive tendering	
	Number of bidders	Not available	

Notes: BD—Bangladesh; BPDB—Bangladesh Power Development Board; MPEMR—Ministry of Power, Energy and Mineral Resources

Source: Dhaka Stock Exchange, 2010; Joseph, 1998; KPCL Annual Report, 2009, 2017.

The project was developed on a BOO basis, with a concession period of 15 years. The concession was later renewed for 5 years. The plant is located in a suburb of the Khulna city. It is the third biggest city in Bangladesh and an industrial hub located in the south-western part of the country, 259 km driving distance from Dhaka.

Financing, guarantees, and agreements

The US$ 103 million project was financed by equity (US$ 47.8 million), an International Finance Corporation (IFC) 'A' loan and equity (US$ 25.8 million), and an IFC 'B' loan [5] (US$ 29.4 millions) (Joseph, 1998). Equity financing was arranged by the El Paso Corporation, Wartsila of Finland, and the locally-based Summit and the United Group (see details in table 6.7). The KPCL signed different agreements with different government bodies and agencies. These agreements included an Implementation Agreement (ImA), a Power Purchasing Agreement (PPA), and a Land Lease Agreement with BPDB (KPCL Annual Report, 2009). The project company itself is responsible for supplying fuel to the plant; this was paid back by the government as a fuel tariff. The Kuo Oil Pte Ltd of Singapore has been supplying the necessary fuel to the company through United Summit Coastal Oil Ltd.

Commercial operation date (COD), tariff and others

The project achieved commercial operation date (COD) for this plant in October 1998 without any schedule delay (KPCL Annual Report, 2009). Figure 6.3 depicts the KPCL project in full operation. The initial contracted tariff rate was US$ 0.0583/kWh;

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[5] When an IFC loan includes financing from the market, it retains a portion of the loan for its own account, which is called the 'A' Loan, and sells participations in the remaining portion to participants. This is called the 'B' Loan.

the agreed tariff structure comprises two components—fuel tariff and other monthly tariff (OMT) (Power Cell, 2006). The fuel tariff is a pass-through item, the cost of which might change depending on the fluctuation of oil prices in the international oil market, and the price of fuel cost for each year is indexed in accordance with power purchase agreement. OMT is calculated based on the electricity volume (MWh) delivered to the grid line (Dhaka Stock Exchange, 2010).

Table 6. 7: Initial project cost and financing structure of KPCL

Components	Estimate (US$ million)
Estimated cost	**103**
Financing structure:	
Equity:	**47.8**
Coastal Power Corp., USA (73.9%)	*35.32*
Wartsila Corp., Finland (6.1%)	*2.92*
Summit Group (local, 10%)	*4.78*
United Group (local, 10%)	*4.78*
Loan (IFC sanction):	**55.2**
IFC A loan	*22.5*
IFC Equity	*3.3*
IFC B loan (Syndicated loan)	*29.4*
Debt-equity ratio	**54:46**

Source: Dhaka Stock Exchange, 2010; Joseph, 1998.

Figure 6. 3: Image of the KPCL

Source: Google map

Risk allocation

The risk allocation to the KPCL is quite similar to that of the HPL. A detailed risk allocation matrix is given in table 6.4. The KPCL differs from the HPL only with respect to the risk allocation of the fuel supply availability. The project company is responsible for importing fuel oil from overseas, and thus the risk is associated with supply by the international oil market. The risk associated with the land acquisition in this project was allocated to BPDB that leased out the required land to the KPCL, but generally, it depends on the land agreement. However, a force majeure event related to importing fuel oil from overseas might be an unavoidable circumstance, the costs of which are shared by both the government and sponsor (KPCL Annual Report, 2017).

Outcomes in relation KPAs

Table 6.8 presents the outcomes of the KPCL in relation to the KPAs.

Table 6. 8: Outcomes of the KPCL in relation to KPAs

KPAs	Outcomes	Objective notes
Planning and initiation	✔	The project was well-planned and developed by experienced international sponsors (El Paso and Wartsila)[a].
Tendering	✔	A competitive tendering process was used to select the sponsors, but information on the number of bidders was unavailable.
Construction and operation	✔	Completed on-budget and on time, and the operation in the life cycle of the project seemed to be smooth without any major difficulties.
Sustainability of partnerships	✔	Partnership sustained for the last 20 years without major disputes including a renewal of 5 years.
Financing	✔	Arranged International Finance Corporation (IFC) loan of US$ 55.2 million and sponsors equity of US$ 47.8 million.
Transparency and accountability	ϕ	The initial procurement of the project was transparent and the life cycle transparency and accountability was relatively better than that associated with the HPL project but still a new issue in PPP performance evaluation.
Stakeholders satisfaction	✔	Relatively low tariffs (US cents 5.83/Kwh) and contribution to power generation (0.72 percent in 2017), and supplying electricity to an under-developed part of the country etc. were some of the satisfying factors.
Socio economic development	ϕ	Contributed to the long-term economic development by generating power and employment, and capital market development by drawing equity from the capital market; But it is difficult to conclude on long term consequences without further empirical analysis.

Notes: ✔ Performance achieved; ϕ Performance partially achieved. [a] *(Dhaka Stock Exchange, 2010)*

Source: Author

Like the HPL, in the KPCL, the performance outcomes in six areas seemed to be fulfilled while they were partially achieved in the 'transparency and accountability' and ‘socioeconomic development’ areas. The indifferent outcomes observed in both of the projects could be linked to public sector determinations in implementing both projects during the early stage of IPPs.

6.3.3 55MW Dhaka Northern Power Generations Ltd (DNPGL)

Key information on DNPGL

The DNPGL was formed in 2013, as a special purpose vehicle (SPV) and subsidiary company of the Dorean Power Generation and Systems Ltd (a local company), to develop the 55 MW dual fuel-based power plants on a BOO basis with a concession period of 15 years. Table 6.9 presents a profile of the DNPGL.

Table 6. 9: Profile of the DNPGL

1	**Project milestones/phases:**	**Date/time estimated:**	**Date achieved:**
	Date tender calling	--	--
	Contract signing (ImA/PPA/GSA/LA)	--	Jan/2013
	Construction/implementation	15 months from Jan/2013	Jun/2014 (approx.)
	Year financial closure	On or before 15 months from Jan/2013	Aug/2014
	Commercial operation date (COD):	Apr/2014	Aug/2016
		Sept/2015 (Required COD)	Aug/2016
2	**Project information:**		
	Installed capacity (MW)	55 MW	
	Generation capacity (MW)	55 MW	
	Fuel type/technology	Heavy Fuel Oil (HFO)	
	Total investment	US$ 49 Million (estimated)	
	Concession period	15 Years from COD	
	Contract type	BOO (Build, Own and Operate)	
	Sponsor/developer	Dhaka Northern Power Generation Ltd (Bangladesh)	
	Project status	Operational	
	Buyer type	Single buyer (BPDB--Bangladesh Power Development Board)	
	Contracted levelised tariff	US cents 8.96/kWh (BDT 6.9898/kWh)	
	Tariff structure	Fuel Tariff (Cost of fuel); Other Monthly Tariff (For operation, maintenance and capacity payment)	
	Contribution to total generation	0.41% (234 GWh in 2017)	
	Government control	Line ministry (MPEMR—Ministry of Power, Energy and Mineral Resources)	
3	**Project attributes/features:**		
	Implementation agreement (ImA, with MPEMR)	The MPEMR guaranteed construction on site and compliance to PPA, and LLA	

Continued……

Power purchasing agreement (PPA, with BPDB)	BPDB is the single off-taker of the energy output
Fuel supply	HFO is imported by the project company (Price changes are adjusted time to time)
Land lease agreement (LLA, with Rural Electrification Board)	REB (Rural Electrification Board) failed to provide land. Later, sponsors purchased 3.7 acres of land
Indemnity agreement	Not available
Procurement method	Competitive tendering
Number of bidders	Number of participating bidders is not known

Source: Dorean, 2018; ICB Capital Management Ltd, 2016.

The plant, which operated on Heavy Furness Oil (HFO), is located at a village in the Manikganj district, around 26 km west of Dhaka (Dorean, 2018).

Financing, guarantees, and agreements

The actual cost of this project was US$ 49 million while the estimated cost was US$ 45 million (see table 6.10). The project was funded by sponsor equity and by loans sourced from Investment Promotion and Financing Facility (IPFF) and local commercial bank at a debt-equity ratio of 75:25. The IPFF is a specialised fund that the World Bank provides to the central bank, provided term loans to infrastructure development projects and promoting private sector entrepreneurs in infrastructure development (World Bank, 2017a). As for earlier projects, this project company signed different agreements, including the Implementation Agreement (ImA), the Power Purchasing Agreement (PPA), and the Land Lease Agreement with REB (Rural Electrification Board). The project company itself is responsible for supplying fuel to the plant; this is paid back by the government as fuel tariff (Dorean, 2018).

Table 6. 10: Initial project cost and financing structure of DNPGL

Components	Estimate (in million) BDT(US$)	Actual (in million) BDT(US$)
Project cost:	**3516 (45)**	**3860 (49)**
Financing structure:		
Equity	**879 (11)**	**965 (12)**
Dorean Ijara Bond		
Own equity		
IPO (Initial Public Offerings) fund		
Loan	**2637 (34)**	**2895 (37)**
IPFF fund (World Bank fund channelled through the central bank)		
NCC Bank Ltd		
Debt-equity ratio		**75:25**

Source: Adroit Environment Consultants Ltd, 2013; Dorean, 2018; ICB Capital Management Ltd, 2016.

Commercial operation date (COD), tariff and others

The DNPGL achieved its commercial operation date (COD) in August 2016 although the scheduled date was in April 2014, which is 15 months after signing the contract. The project company has argued that delay is related to the REB's (who signed the land lease agreement) failure to handover the required land. Subsequently, the project company purchased 3.7 acres of land in a new location, obtained approval for the new site and completed land registration. These unexpected activities delayed implementation of the project. As per the PPA, there is a provision for recalculating project implementation time should causes of delay be treated as a 'Force majeure event', and this recalculated time is called a required commercial operation date (RCOD). In this case, the RCOD was in September 2015, but the actual COD was in August 2016. Thus, the project company was still around one year behind on the agreed acceptable operation date.

However, when such a delay in achieving the RCOD does not attract the relevant clauses of PPA, compensation shall be paid to BPDB as per the clause of liquidated damages. The DNPGL applied to BPDB for an exemption from paying the liquidated damages, on the grounds that the delay in achieving project COD that occurred was due, not to the company's failure, but instead to the REB's failure to transfer land to them in due course. The outcome of this exemption application is unclear and so has been unreported in this document. The initial contracted tariff rate was BDT 6.9898/kWh (US$ 0.0896), which represents a similar tariff structure to that applicable to the KPCL (ICB Capital Management Ltd, 2016).

Risk allocation

Since the DNPGL and DSPGL are similar with respect, for example, to plant types, ownership, financing source and implementation time, they are considered together for presenting their risk allocation. The detailed risk allocation matrix (see table 6.4) provides an overall understanding of the risk allocation. In addition, some other risks related to land acquisition, currency convertibility and transaction and political force majeure are discussed later (section 6.3.4). Because the owner of both of these companies is from Bangladesh, the risk of foreign currency convertibility and transaction is likely to be less than that associated with the HPL and KPCL projects.

Outcomes in relation to KPAs

The performance objectives in this project have been fulfilled by fewer KPAs compared to the earlier two projects. The outcomes of this project are presented in table 6.11. The KPAs included 'tendering', 'sustainability of partnerships', and 'financing' in which the performance objectives were fully achieved in light of the PPP configuration. The objectives in KPA 'planning and initiation', 'transparency and accountability', 'stakeholder satisfaction', and 'socioeconomic development' were only partially achieved, while the objectives in the 'construction and operation' area remained unfulfilled.

Table 6. 11: Outcomes of the DNPGL in relation to KPAs

KPAs	Outcomes	Objective notes
Planning and initiation	Φ	Project land could not be provided as per agreement, which might be the consequence of an inadequate feasibility study.
Tendering	✔	A competitive tendering process was used and a local developer (Dorean Power) was awarded, but information on the number of bidders was unavailable.
Construction and operation	✖	Completed on US$ 4 million above its contract agreement and 15 months behind schedule, but has been in operation since 2016.
Sustainability of partnerships	✔	Partnership has just begun in 2016 and continued satisfactorily until now of a 15 years contract term. Dispute on land acquisition that delayed construction was settled as per agreement
Financing	✔	Arranged Investment Promotion and Financing Facility (IPFF) and commercial bank loan of US$ 37 million in addition to *Dorean Ijara Bond* (sponsors equity) of US$ 12 million
Transparency and accountability	Φ	Using competitive tendering suggested relatively better transparency in the initial procurement, but information on the operational transparency were unavailable
Stakeholders satisfaction	Φ	Contribution to power generation (0.41 percent in 2017), access to innovative financing etc. were some of the satisfying indicators. In contrast, cost overruns and delay were dissatisfying factors.
Socio economic development	Φ	Contributed to the long-term economic development by generating power and employment, and capital market development by drawing equity from the capital market; But it is difficult to conclude on the long-term consequences without further empirical analysis.

Notes: ✔ Performance achieved; ✖ Performance not achieved; ϕ Performance partially achieved

Source: Author

6.3.4 55MW Dhaka Southern Power Generations Ltd (DSPGL)

Key information on DSPGL

The DSPGL, also a subsidiary of the Dorean Power Generation and Systems Ltd, was formed in 2013 to develop 55MW dual fuel-based power plants on a BOO basis with a concession period of 15 years. This plant operates on Heavy Furness Oil (HFO) and is located at Daulatpur (a village) in Nawabganj district, around 32 km southwest of Dhaka (Dorean, 2018). Details of the project are given in table 6.12.

Table 6. 12: Profile of the DSPGL

1	**Project milestones/phases:**	Date/time estimated:	Date achieved:
	Date tender calling	--	--
	Contract signing (ImA/PPA/GSA/LA)	--	Jan/2013
	Construction begins	15 months from Jan/2013	Not available
	Year financial closure	On or before 15 months from Jan/2013	Jan/2014
	Commercial operation date (COD):	Apr/2014	Jun/2016
		Jun/2014 (Required COD)	Jun/2016
2	**Project information:**		
	Installed capacity (MW)	55 MW	
	Generation capacity (MW)	55 MW	
	Fuel type/technology	Heavy Fuel Oil (HFO)	
	Total investment	US$ 47 Million (estimated)	
	Concession period	15 Years from COD	
	Contract type	BOO (Build, Own and Operate)	
	Sponsor/developer	Dhaka Southern Power Generation Ltd (Bangladesh)	
	Project status	Operational	
	Buyer type	Single buyer (BPDB—Bangladesh Power Development Board)	
	Contracted levelised tariff	US cents 8.96/kWh (BDT 6.9898/kWh)	
	Tariff structure	Fuel Tariff (Cost of fuel); Other Monthly Tariff (For operation, maintenance and capacity payment)	
	Contribution to total generation	0.41% (234 GWh in 2017)	
	Government control	Line ministry (MPEMR—Ministry of Power, Energy and Mineral Resources)	
3	**Project attributes/features:**		
	Implementation agreement (ImA, with MPEMR)	MPEMR guaranteed construction on site and compliance to PPA, and LLA	
	Power purchasing agreement (PPA, with BPDB)	BPDB is the single off-taker of the energy output	
	Fuel supply	HFO is imported by the project company (Price changes are adjusted time to time)	
	Land lease agreement (LLA with Rural Electrification Board)	REB provided land.	
	Indemnity agreement	Not available	
	Procurement method	Competitive tendering	
	Number of bidders	Number of participating bidders is not known	

Source: (Dorean, 2018; ICB Capital Management Ltd, 2016).

The project was set up in 7 acres of land provided by the REB as per the LLA agreement. The land was vacant when the contract was signed and thus there were no resettlement issues. The project is surrounded by nearby dwellings on two sides and by agricultural lands on the other two sides. The environmental impact assessment conducted prior to the COD asserted that there might potentially be adverse environmental impacts on the surroundings, though those impacts were considered manageable. However, an environmental impact assessment after implementing the project was suggested to understand the post-implementation impact of the project (Adroit Environment Consultants Ltd, 2013).

Financing, guarantees, and agreements

The actual cost of the DSPGL was US$ 47 million against an initial estimated cost of US$ 45 million, which was greater than that of the DNPGL. But both the projects are of the equal capacity of 55MW. The DSPGL costs more, probably because of the greater area of land required to be purchased. Both projects were funded by sponsor equity and by loans sourced from Investment Promotion and Financing Facility (IPFF) and a local commercial bank (the NCC Bank Ltd) at a debt-equity ratio of 75:25. The project company signed agreements that included the Implementation Agreement (ImA), a Power Purchasing Agreement (PPA), and a Land Lease Agreement with REB. The project company itself is responsible for supplying fuel to the plant, but this is paid back by the government as a fuel tariff (Dorean, 2018). The project cost and financing structure of the DSPGL are presented in table 6.13.

Table 6. 13: Project cost and financing structure of DSPGL

Components	**Estimate BDT (US$)**	**Actual BDT (US$)**
Project cost:	**3516 (45)**	**3706 (47)**
Financing structure:		
Equity	**879 (11)**	**926 (12)**
Dorean Ijara bond		
Own equity		
IPO (Initial Public Offerings) fund		
Loan	**2637 (34)**	**2780 (35)**
IPFF fund (World Bank fund channelled through the central bank)		
NCC Bank Ltd		
Debt-equity ratio		**75:25**

Source: (Dorean, 2018; ICB Capital Management Ltd, 2016).

Commercial operation date (COD), tariff and other

The DSPGL achieved a commercial operation date (COD) in June 2016 against the scheduled date in April 2014; the revised date (called RCOD), in June 2014, included a 70-day ‘force majeure event’[6] caused by political unrest (e.g., hartal or strikes of the opposition parties). Taking the RCOD into account, the project company was nonetheless 14 months behind its schedule to commence commercial operation. For these delays, compensation should be paid to BPDB as per the clause of liquidated damages under the PPA agreement. The DSPGL applied to BPDB to defer those compensation payments until the plant went into commercial operation, given that the project company might fall into cash flow crisis if the payments were paid at the project implementation phase (ICB Capital Management Ltd, 2016). The outcome of the deferral application is unpublished. The tariff rate was BDT 6.9898/kWh (US$ 0.0896), similar to the tariff rate that applies to DNPGL in its similar tariff structure (ICB Capital Management Ltd, 2016). The details of the tariff structure have been described in the KPCL case. Risk allocation for DSPGL is similar to that of DNPGL (see risk allocation sub-section in DNPGL).

Outcomes in relation to KPAs

The performance objectives in this project are fulfilled in four KPAs: ‘planning and initiation’, ‘tendering’, ‘sustainability of partnerships’, and ‘financing’. These objectives are unfulfilled in the ‘construction and operation’ area. They are partially achieved in the performance areas that comprise ‘transparency and accountability’, ‘stakeholder satisfaction’, and ‘socioeconomic development’. Details of the outcomes are given in table 6.14.

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[6] 70 days were allowed as force majeure event. For remaining of the excess of the delays, liquidity damages need to be paid by the project company to BPDB

Table 6. 14: Outcomes of the DSPGL in relation to KPAs

KPAs	Outcomes	Objective notes
Planning and initiation	✔	Planning and initiation was satisfactory since no such issues were reported.
Tendering	✔	A competitive tendering was used and a local developer (Dorean Power) was awarded, but the number of bidders were unavailable
Construction and operation	✖	Completed US$ 2 m above its contract agreement and 14 months behind schedule, but has been in operation since 2016
Sustainability of partnerships	✔	Partnership has just begun in 2016 and continued satisfactorily until now of a 15 years contract term. The settlement of a liquidated damages for the delay was in process
Financing	✔	Arranged Investment Promotion and Financing Facility (IPFF) and commercial bank loan of US$ 35 million in addition to *Dorean Ijara Bond* (sponsors equity) of US$ 12 million
Transparency and accountability	ϕ	Using competitive tendering suggested relatively better transparency in the initial procurement, but information on operational transparency were unavailable
Stakeholders satisfaction	ϕ	Contribution to power generation (0.41 percent in 2017), access to innovative financing etc. were some indicators for stakeholders to be satisfied. In contrast, cost overruns and delay in implementation as well as environmental concerns in nearby areas were some dissatisfying factors
Socio economic development	ϕ	Contributed to the long-term economic development by generating power and employment, and capital market development by drawing equity from the capital market , but it is difficult to conclude on long term consequences without a full cost-benefit analysis

Notes: ✔ Performance achieved; ✖ Performance not achieved; ϕ Performance partially achieved

Source: Author

6.3.5 150MW B-R Powergen Ltd (B-R)

Key information on project background

The B-R Powergen Limited, a joint venture company formed by the Bangladesh Power Development Board (BRDB) and the Rural Power Company Limited (RPCL), was awarded to implement this 150MW dual fuel-based power plant on an unsolicited proposal submitted by them. This is a special type of joint venture, which is limited by shares owned by BPDB and RPCL on a 50:50 equity composition. A brief information summary for this project is provided in table 6.15.

Table 6. 15: Profile of the B-R

1	**Project milestones/phases:**	**Date/time estimated:**	**Date achieved:**
	Date tender calling	--	--
	Contract signing (ImA/PPA/GSA/LA)	--	Dec/2013
	Construction begins	--	Aug/2015
	Year financial closure	--	Jul/2013
	Commercial operation date (COD):	Feb/2015	Aug/2015
2	**Project information:**		
	Installed capacity (MW)	150 MW	
	Generation capacity (MW)	149 MW	
	Fuel type/technology	Heavy Fuel Oil (HFO)	
	Total investment	US$ 156 Million (actual)	
	Concession period	20 Years from COD	
	Contract type	BOO (Build, Own and Operate)	
	Sponsor/developer	B-R Powergen Ltd	
	Project status	Operational	
	Buyer type	Single buyer (BPDB—Bangladesh Power Development Board)	
	Contracted levelised tariff	BDT 13.25/Kwh (from annual report 2016-2017	
	Tariff structure	Fuel Tariff (Cost of fuel) Other Monthly Tariff (For operation, maintenance and capacity payment)	
	Contribution to total generation	1.19% (686 GWh in 2017)	
	Government control	Line ministry (MPEMR, Ministry of Power, Energy and Mineral Resources)	
3	**Project attributes/features:**		
	Implementation agreement (ImA, with MEMR)	Not applicable	
	Power purchasing agreement (PPA, with BPDB)	BPDB is the single off-taker of the energy output	
	Fuel supply	HFO is imported by the project company (Price changes are adjusted time to time)	
	Land lease agreement (LLA with Rural Power Co Ltd)	RPCL provided land	
	Guarantee agreement against credit	By Ministry of Finance	
	Procurement method	Unsolicited proposal	
	Number of bidders	Not Applicable	

Source: (B-R Annual Report, 2016).

The BPDB is a purely state-owned organisation while the RPCL is a Bangladeshi public limited company. The plant is located in a suburb (KODA) of the Gazipur district adjacent to Dhaka city (B-R Annual Report, 2016).

Financing, guarantees, and agreements

The actual cost of this project was US$ 156 million. The project was developed under an engineering, procurement and construction (EPC) contract signed with M/S M/S C *CCCE*-ETERN-*SPEC* JOINT *VENTURE* of China. Out of the total EPC price, two Chinese banks financed the project with buyer's credit of US$ 133 million on 85:15 debt-equity ratios (see table 6.16 for). The project company signed a Power Purchasing Agreement (PPA) with BPDB, as well as a fuel supply agreement with state-owned fuel companies. The required project land was provided by RPCL as per the land lease agreement. The government guaranteed to the financiers through a 'Guarantee Agreement against Credit' in case of any repayment defaults by the project company (B-R Annual Report, 2016).

Table 6. 16: Project cost and financing structure of B-R

Components	**Estimate BDT (US$)**	**Actual BDT (US$)**
Project cost:	13098 (156)	13098 (156)
Financing structure:		
Equity	1965(23)	1965(23)
Buyer's credit	9988 (133)	9988 (133)
Export-import Bank of China		
Industrial and Commercial Bank of China		
Debt-equity ratio	**85:15**	**85:15**

Source: B-R Annual Report, 2016.

Commercial operation date (COD), tariff and others

The project was completed on budget, but with a schedule delay of 6 months. The reasons of the delay were unknown. After starting commercial operation on 16 August, 2015, the plant has successfully been operated for more than one year without any trouble. The same tariff structure applied to other projects is applicable to this project as well. However, the tariff rate calculated from the annual report of 2017 of this project was BDT 13.25 /Kwh, including capacity and energy payments, which is higher than that from other privately owned IPPs (B-R Annual Report, 2016, 2017). The higher tariff rate provided to state-owned power generation companies created an unfair competitive environment for private power producers.

Risk allocation

Risk allocation of this project (B-R) and the next one (H412) might be irrelevant for discussion because the owners of these two projects are ultimately state-owned entities by holding shares of the company on 50:50 basis. However, they are considered relevant to be included in our selected cases to understand their status as IPPs and in order to have their performance outcomes compared to privately owned IPPs in power generation.

Outcomes in relation to KPAs

Table 6.17 presents the details of the performance outcomes of the B-R.

Table 6. 17: Outcomes of the B-R in relation to KPAs

KPAs	Outcomes	Objective information
Planning and initiation	✔	Planning and initiation was satisfactory since there were no related issues
Tendering	✖	Non-competitive tendering (unsolicited proposals) was used to award the contract to a state owned joint venture (B-R Powergen Ltd)
Construction and operation	ɸ	Completed on Engineering, Procurement and Construction (EPC) contract on-budget but 6 months behind schedule. Has been in operation since 2015
Sustainability of partnerships	✖	It is a public-public partnership, and thus did not meet this objective
Financing	✔	Arranged buyer's credit of US$ 133 million provided by two Chinese companies in addition to *equity* of US$ 23 million by the government
Transparency and accountability	ɸ	Using competitive tendering (in EPC contract) suggested relatively better transparency in the initial procurement. However, the transparency and accountability between public-private partnership seemed to be irrelevant since this company is a public joint venture
Stakeholder satisfaction	ɸ	Contribution to power generation (1.19 percent in 2017), access to innovative financing etc. were some satisfying factors while the delay in implementation was dissatisfying
Socioeconomic development	ɸ	Contributed to the long-term economic development by generating power and employment; But efficiency gains appeared to be compromised considering the lack of competitiveness in selecting the concessionaire.

Notes: ✔ Performance achieved; ✖ Performance not achieved; ɸ Performance partially achieved

Source: Author

This project and the next (H412) are different from the earlier four projects with respect to ownership. Being different, this project has some performance objectives which fit better into the evaluation mechanism of a traditional procurement than into the KPA system of the PPP option. As a result, most of the performance objectives are found partially fulfilled or unfulfilled in this project. The KPAs in which these objectives are not completely fulfilled are 'tendering', 'sustainability of partnerships', 'construction and operation', 'transparency and accountability', and 'stakeholder satisfaction'. For the two remaining KPAs ('planning and initiation' and 'financing'), the objectives are completely fulfilled.

6.3.6 412MW Haripur Power Plant (H412)

Key information on H412

The Electricity Generation Company of Bangladesh (EGCB), a state-owned power generation company, implemented the H412 combined cycle power plant in a power generation hub located at Haripur in the Narayanganj district. A profile of this project is shown in table 6.18.

Table 6. 18: Profile of the H412 power plant

1	**Project milestones/phases:**	**Date/time estimated:**	**Date achieved:**
	Date tender calling	--	--
	Contract signing (ImA/PPA/GSA/LA)	--	Sept/2013 (PPA) Aug/2011 (LLA) Aug/2015 (GSA)
	EPC (Turn-key) contract	--	Feb/2011 (29 months)
	Construction begins	--	Not available
	Year financial closure	Finance was available from 2007 onward from JICA	
	Commercial operation date (COD):	Jul/2013	April/2014
2	**Project information:**		
	Installed capacity (MW)	428 MW	
	Generation capacity (MW)	428 MW	
	Fuel type/technology	Gas	
	Total investment	US$ 433 Million (actual)	
	Concession period	Not available	
	Contract type	EPC (Turn-key) contract	
	Developer	EGCB (Electricity Generation Company of Bangladesh)	
	Project status	Operational	

Continued…….

	Buyer type	Single buyer (BPDB—Bangladesh Power Development Board)
	Contracted levelled tariff	BDT 1.7154/kWh
	Tariff structure	Energy payment + capacity payment
	Contribution to total generation (in the country)	5% (2874 GWh in 2017)
	Government control	Line ministry (MEMR, Central Govt.)
3	**Project attributes/features:**	
	EPC contract	Marubeni Corporation constructed the project
	Power purchasing agreement (PPA, with BPDB)	BPDB is the single off-taker of the energy output
	Gas supply agreement with Titas	Titas gas company will supply gas
	Land lease agreement (LLA with BPDB)	BPDB provided land.
	Guarantee agreement against credit	By Ministry of Finance
	Procurement method	Unsolicited proposal
	Number of bidders	Not applicable

Note: JICA—Japan International Cooperation Agency
Source: H412 Annual Report, 2015, 2017.

Financing, guarantees, and agreements

The actual cost of the project was US$ 433 million, against an estimate of US$ 508 million[7]. The Japan International Cooperation Agency (JICA) provided a soft loan at around 2 percent interest rate, repayable in 20 years including a 5-year grace period. The loan agreement between the Government of Bangladesh (GoB) and JICA was signed in 2007 and 2009, well ahead of the financial closure for the project. The project company signed a PPA with BPDB, and a gas supply agreement with the Titas Gas Company as well as a LLA with BPDB. The BPDB leased out, for this project, 8.573 acres of land within the Haripur power hub (H412 Annual Report, 2015). The project cost and source of financing are presented in table 6.19.

[7] US$ 433 million was equivalent to BDT 33,763 million and US$ 508 million was equivalent to BDT 39659 million @BDT78

Table 6. 19: Project cost and financing structure of H412

Components	Estimate (million) BDT(US$)	Actual (million) BDT(US$)
Project cost:	39659 (508)	33763 (433)
Financing structure:		
Equity:		
GoB (includes EGCB, PGCB and REB)	5781(74)	3241(42)
Development project aids (DPA):	33878 (434)	30522 (391)
(JICA provided loans at 2% interest rate)		
DPA-equity ratio	**85:15**	**90:10**

Source: (H412 Annual Report, 2015).

Commercial operation date (COD), tariff and others

Against a scheduled commercial operation date in July 2013, the project achieved the COD on 6 April, 2014, nine months behind that expected date. The actual cost was well below the estimated cost, primarily because of the foreign currency gain on the JICA loan provided for financing the project (H412 Annual Report, 2015). The tariff rate for this project was BDT 1.7154/kWh, as per PPA in 2013, based on the similar tariff structure applicable to other gas-based plants such as the HPL; details of the tariff structure have been stated in the HPL (H412 Annual Report, 2017). Because the plant is based on gas fuel, the tariff rate is much lower than that of the Furness oil-based facilities.

Outcomes in relation to KPAs

As with the B-R Powergen Ltd, this project has similar performance objectives under the different KPAs (see in table 6.20), except in the area of planning and initiation, in which the performance objectives are fulfilled. Since both these projects are associated with public sector entities, the ultimate responsibilities in terms of construction, operation, and transparency remain with the public sector. However, both projects have access to innovative financing that includes buyer's credit and development aids.

Table 6. 20: Outcomes of the H412 in relation to KPAs

KPAs	Outcomes	Objective information
Planning and initiation	✔	Planning and initiation was satisfactory since there were no related issues
Tendering	✖	Non-competitive tendering (based on unsolicited proposals) was used to award the contract to a state-owned power generation company (Electricity Generation Company of Bangladesh)
Construction and operation	ϕ	Completed on Engineering, Procurement and Construction (EPC) contract on below its contract agreement, but 9 months behind schedule; Has been in operation since 2014.
Sustainability of partnerships	✖	It has been operated by a state-owned electricity company, and no such partnership exists.
Financing	✔	Arranged JICA loan (development assistance) of US$ 391 in addition to *equity* of US$ 42 million by the government.
Transparency and accountability	ϕ	Using competitive tendering (in EPC contract) suggested relatively better transparency in the initial procurement; However, the transparency and accountability between public-private partnerships seemed to be irrelevant since this operating company is a state-owned entity.
Stakeholders satisfaction	ϕ	Contribution to power generation (5 percent in 2017), under-budget construction, and access to innovative financing etc. were some satisfying factors while the delay in implementation was dissatisfying.
Socio economic development	ϕ	Contributed to the long-term economic development by generating power and employment; But efficiency gains appeared to be compromised considering the lack of competitiveness in selecting the concessionaire.

Notes: ✔ Performance achieved; ✖ Performance not achieved; ϕ Performance partially achieved
Source: Author

6.4 Analysis and discussion

Based on the case presentation, it is clear that all six projects have similarities and dissimilarities, with respect to their level of performances, depending on their mode of partnerships, implementation period, technology types and plant size. It is expected that findings would be drawn from the following analysis (see sub-section 6.4.1) and discussion (sub-section 6.4.2).

6.4.1 Outcomes in relation to initial goals

The analysis and discussion in this part focus on the goals achieved against the initial ones applicable to all of the projects. A summary of the achievement of the goals has been presented in table 6.21.

Table 6. 21: Summary of the goals achieved by the selected projects

Performance areas/objectives	Project outcomes					
	HPL	KPCL	DNPGL	DSPGL	B-R	H412
Improve power supply	√	√	√	√	√	√
Private participation	√	√	√	√	×	×
Entrepreneurship development	√	√	√	√	×	×
Innovative financing	√	√	√	√	√	√
Capital market development	×	√	×	×	×	×
Harness competition	√	√	√	√	×	×
Fuel diversification	×	√	√	√	√	×
Fair and competitive tariffs	√	√	√	√	×	×
Efficiency gains	√	√	?	?	?	?
Risk transfer	√	√	√	√	×	×

Notes: √ = Goal achieved; × = Goal not achieved; and **?** = Goal is in question

Source: Author

Improving power supply

Clearly, all selected IPPs have made a substantial contribution to improving power supply in the country since they are found operational to be in an expected level of plant factors and regularly added electricity to the national grid. As of 2017, all IPPs provided approximately 20 percent of the total generation capacity including our selected ones (BPDB Annual Report, 2017).

Private participation and entrepreneurship development

Since the B-R and H412 are state-owned operators, private participation is irrelevant to them. In other projects, both foreign and local sponsors participated, especially the local sponsors involved in later projects (DNPGL and DSPGL), which indicates a development of local entrepreneurs. In KPCL, a local subsidiary called Khulna Power Operations and Services Ltd was formed to repair and maintain KPCL plants (KPCL Annual Report, 2009). However, a limited number of entrepreneurs are involved in developing most of the IPPs, probably based on their connection with the government counterpart. The positivity of local entrepreneurship development might be offset by the efficiency loss resulting from sub-optimal design, construction and operation of the projects by inexperienced and unprofessional entrepreneurs. Careful evaluation of concessionaire with a fair intention of implementing authority in accordance with set guidelines and strict coherence could reduce the likelihood of selecting inappropriate entrepreneurs.

Innovative financing and capital market development

Financing has been perceived to be one of the most important performance areas of PPPs in Bangladesh (Hossain, Guest, & Smith, 2018b), and scarcity of finances for undertaking mega power projects has motivated the government in Bangladesh to search for innovative financing (UNCTAD, 2013). Coming out of the dependency on budgetary allocation for power project development, the government was initially successful in attracting the World Bank and other international commercial lenders to invest in power generation projects (M. Khan et al., 2012). For example, International Finance Corporation (IFC) provided a loan to Haripur Power Ltd (HPL) and KPCL, and local investors of the DNPGL and DSPGL arranged commercial loans from a local bank (NCCBL). Specifically, the B-R and H412 projects were able to have access to truly innovative financing. The B-R arranged buyer's credit from two Chinese banks (Export-import Bank of China and Industrial and Commercial Bank of China) backed by the government, and the H412 organised finance from JICA in the form of development project aids (DPA).

However, the local commercial banks are unable to provide large-scale loans because they have limitations imposed by the central bank. They provide small-sized loans (57 million US$ is the highest until now), but mega power projects usually require more than 100 million dollars (World Bank, 2015). Thus, it seems that the involvement of the World Bank and its associated organisations played an important role for the HPL and KPCL projects to be successful IPPs in Bangladesh. Other projects appear to be performing less well, considering, for example, their cost and schedule performance.

Harness competition

The competitive and fair bidding process was obviously rewarding in case of HPL and KPCL. However, it seemed to be inconclusive with respect to DNPGL and DSPGL. Unsolicited proposals in case of the B-R and H412 limited the scope of competition, which might act to hamper efficiency gains to be achieved from these projects. In earlier studies, competitive tendering was considered a pre-requisite to a successful IPP in Bangladesh and in other countries (M. Khan et al., 2012; T. Liu et al., 2016).

Fuel diversification

Natural gas was the primary fuel for most of the IPPs in the first and second phase in Bangladesh. But most of the recently developed power plants are based on imported heavy fuel oil (BPDB Annual Report, 2017). This certainly reduced pressure on primary fuel and diversified the fuel sources drawn by future plants. However, oil-based power plants are expensive and in the long run, they may be cost-ineffective (Phadke, 2009). It is also highly likely that irregularities might take place through showing higher fuel consumption than the standard amount agreed. For instance, some receivables of the KPCL remained unpaid by the BPDB (buyer) on the basis of being unhappy with the higher fuel consumption (KPCL Annual Report, 2017). Additionally, offloading of imported fuel oil and transporting it to the plant sites seemed to be difficult for all projects except the HPL project, which operates on gas. This goal is considered to be achieved if the plant is operated on a fuel other than gas.

Fair and competitive tariff & efficiency gains

The tariff rates for the HPL project were one of the lowest tariffs applicable in the private sector power generation sector, while the rate for KPCL was relatively higher because of the use of heavy fuel oil in the plant. The fuel-oil-based IPPs represent a costlier option than a gas-based one because of the higher price of oil in the international oil market. Furthermore, the rate for DNPGL and DSPGL was even higher since these were recent power plants procured with relatively higher prices incurred for equipment, and they operated on an increased cost of fuel oil. The B-R was also provided with a relatively higher tariff rate of BDT 13/Kwh (levelised tariff) while the H412 was awarded a rate that was close to the rates of other gas-based IPPs. Clearly, the tariff rate is different for public and private sector producers based on their ownership, technology types and contract terms. A competitive tariff of different types is desirable, but inappropriate pricing might discourage competitors including international bidders. Thus, benchmarking of the tariff is needed to ensure competitive pricing for both local and foreign investors.

The government, however, provides subsidies to bridge the gap between generation cost and selling prices of electricity to ensure affordable and reliable electricity to all by 2021. The single-buyer option guaranteed the purchase of electricity with no price shocks and made the investment risk-free in IPPs. Further, the fuel cost of generating power is also paid back by the government in the form of an energy payment within the tariff structure. On the other hand, foreign investors seem to be uncomfortable with the long-term ability of the government to pay for the generated electricity (World Bank, 2015). Given this, a fair and competitive tariff rate might act as a strong incentive to gain the confidence of the investors. Gaining their confidence could provide a foundation for making IPPs cost-effective that would ultimately contribute to efficiency gains.

Risk allocation

With regards to risk transfer to the IPPs, mixed results are evident. Ideally, risks related to design and construction, part of the operation and natural force majeure were transferred to private sponsors in all six projects. Other risks that include the cost of fuel, revenues, political force majeure, land acquisition, and regulatory risk, remained with the government through various government guarantees and agreements. The justification of these risks to be with the government might be that private sponsors individually would be unable to mitigate these risks without the support of the government. However, the fuel supply risk of all projects, with the exception of the HPL, was with the sponsors since the fuel oil was directly imported by them from overseas. The HPL is run on gas that is locally supplied by the state-owned Tits Gas Company.

The case presentation in this chapter reveals that cost overruns and schedule delay were common features in most of the selected projects while the interest in using the PPP option in different sectors, including the power sector, has recently expanded in Bangladesh. Except for the HPL and KPCL, the other four projects missed the deadline of achieving the pre-specified commercial operation date. The delays ranged from six to fifteen months in four projects; the highest one being with the DNPGL. Likewise, three out of the same four projects were completed beyond the estimated cost, but the H412 was completed at less cost than the initial estimate by US$ 75 million, primarily because of the foreign currency gains from the JICA loan. Cost overruns are generally linked to the delay of project completion. In earlier reporting, the schedule lapses in completing airport and transport PPPs in Bangladesh have been documented (ADB, 2017). Similarly, they are commonly reported in other developing countries as well (Almarri & Boussabaine, 2017). However, the HPL and KPCL performed satisfactorily, especially with respect to cost and time considerations.

The analysis and discussion on the experiences of the six projects suggest that performance objectives (areas) that include improving power supply and innovative financing are fulfilled in both the public and private sector power projects. Conversely, the performance areas such as private participation, entrepreneurship development, competition, competitive tariffs, and risk transfer are achieved only in the projects operated by private sector sponsors, and unfulfilled in the projects operated by public sector entities. These performance areas are generally unexpected when the public sector is involved in power generation. Additionally, the participation of foreign investors has limited the scope of local capital market development, which happened in the case HPL. Since the HPL is unlisted in the local capital market, it has made no contribution to local capital market development.

The analysis in this chapter as well as the understanding gained from the related literature (N. Islam, 2015; M. Khan et al., 2012; S. Khan, 2007) reveal that the public sector commitment/determination in Bangladesh seems to be more important than the enactment of legislation for the success of the power sector PPPs. Applying laws depends on the institutional qualities, which are generally deficient in developing countries including Bangladesh, as indicated by existing literature (Hammami et al., 2006; Panayides et al., 2015). The sincerity of the government contributed to making the HPL and KPCL successful in terms of all aspects of PPP configuration. The public sector determination seemed to have helped overcome policy hurdles in both these projects, while their unwillingness could affect any of the performance areas even in the presence of required policy support from the government. Because of the strong commitment of the government, foreign companies participated in bidding for the initial IPPs: two (Applied Energy Services and El Paso) won the contract in a fair and transparent tendering process, for developing the HPL and KPCL respectively. According to the World Bank, the government provided sincere support and showed uncompromising attitudes to any other vested interest to implement these projects. As a result, both the projects are considered to have achieved value for money and thus efficiency gains (World Bank, 2014a). However, to understand efficiency gains conclusively in the long run, in-depth empirical research is needed, focusing on an analysis of the cost-effectiveness of the IPPs in Bangladesh.

6.4.2 Outcomes in the context of KPAs

This part of the discussion focuses on the KPAs to which the actual performance objectives are aligned for evaluating project performances. The performance objectives in the eight KPAs are either fulfilled, partially fulfilled or unfulfilled. The summary of the outcomes of the six projects in relation to the KPAs is presented in table 6.22.

Table 6. 22: Outcomes in the context of KPAs by projects

Key performance areas (KPAs)	HPL	KPCL	DNPGL	DSPGL	B-R	H412
(PI) Planning and initiation	✔	✔	ϕ	✔	✔	✔
(T) Tendering	✔	✔	✔	✔	✖	✖
(CO) Construction and operation	✔	✔	✖	✖	ϕ	ϕ
(SP) Sustainability of partnerships	✔	✔	✔	✔	✖	✖
(F) Financing	✔	✔	✔	✔	✔	✔
(TA) Transparency and accountability	ϕ	ϕ	ϕ	ϕ	ϕ	ϕ
(SS) Stakeholder satisfaction	✔	✔	ϕ	ϕ	ϕ	ϕ
(SED) Socioeconomic development	ϕ	ϕ	ϕ	ϕ	ϕ	ϕ

✔= Performance objectives in the KPA achieved;
× = Performance objectives in the KPA not achieved; and
ϕ = Performance objectives in the KPA partially achieved
Source: Author

Although the KPA system presents an almost identical status in respect of the overall performance of the various projects described in this chapter, careful insight provides an improved understanding of the differences between the projects. For instance, the failure of land transfer by the Rural Electrification Board (REB) to the DNPGL is reflected in the KPAs (in the 'planning and initiation' area) and shows the DNPGL to be less performing than the DSPGL. Both have performance objectives unfulfilled in the area of 'construction and operation' but are shown to have these objectives achieved when a more traditional approach is used. In the 'construction and operation' area, both projects have cost overruns and schedule delay, which remain uncaptured in the traditional mechanism.

The performance objectives related to the areas that include 'transparency and accountability' and 'socioeconomic development' are partially achieved in all of the projects, even in the publicly operated ones (B-R and H412) using the KPA system. But they are shown to be fulfilled using a more traditional approach. Additionally, the stakeholder satisfaction in the majority of the projects is partially achieved, except in the HPL and KPCL, in which they are found perfectly fulfilled.

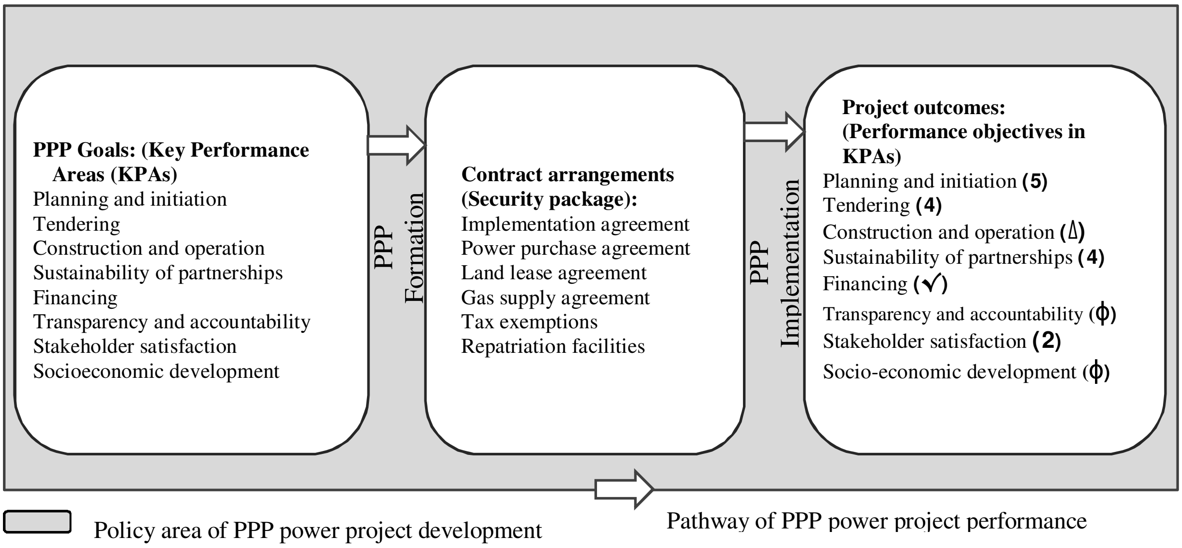
The KPA system developed in this study is based on a life cycle approach, which includes different phases of the PPPs and different interest of the stakeholders. Accordingly, it has better scope for more performance objectives to be included in this system than in the traditional approach. Under the traditional method, the government generally sets some major goals to be fulfilled through using the PPP option while the KPA system allows wider performance objectives to be included in the different KPAs in the whole life of the PPPs. This wider scope probably makes the KPA system more inclusive, with relatively more performance objectives that are neglected in the traditional approach.

There are some commonalities as well in the outcomes using both approaches. The performance objectives related to the 'financing' area are achieved in all of the projects, including the public sector operators, using either of the approaches. The long-term consequences of using the PPP option instead of traditional procurement are related to the 'socioeconomic development' area, which has been evaluated as partially fulfilled when the KPA system is used. However, these consequences seemed to be difficult to be measured conclusively by using either of the approaches. This suggests an area for fruitful future research, since the methodology and data needs to fully assess the wider socio-economic impact of PPP projects is relatively underdeveloped in the Bangladesh context.

Similarly, the performance objective of efficiency gains in the traditional framework is also difficult to measure using either of the approaches.

A pathway framework of power sector PPP performance evaluation has been proposed based on the conceptual framework developed by Wang & Zhao, (2018). Each of the eight KPAs will have a number of performance objectives. The KPAs are considered to be PPP goals that are agreed to be achieved by the guidance of the contractual arrangements. Under the contractual arrangements, the security package comprises several agreements signed with the government and other related organisations. Details of this process with the outcomes of the six projects are presented in figure 6.4.

Figure 6. 4: Pathway framework of power sector PPP performance



5 = Goal achieved in five projects—HPL, KPCL, DSPGL, B-R, and H412 and partially achieved in DNPGL
4 = Goal achieved in four projects—HPL, KPCL, DNPGL and DSPGL and NOT achieved in B-R and H412
Δ = Goal achieved in HPL and KPCL, NOT achieved in DNPGL and DSPGL, and partially achieved in B-R and H412
√ = Goal achieved in all projects
Φ = Goal partially achieved in all projects
2 = Goal achieved in two projects—HPL and KPCL and partially achieved in DNPGL, DSPGL, B-R and H412

Source: Adapted from Wang & Zhao, 2018.

6.5 Concluding remarks

The objective of this chapter was to explore the performance areas of power sector PPPs in Bangladesh using case analysis with the help of relevant conceptual frameworks and to find differences in the outcomes resulting from using the KPA system. The study, therefore, proposed a pathway framework of the power sector PPP performance evaluation based on the Bangladesh experience, and pointed to some differences in the outcomes using the two different evaluation approaches along with other findings discussed in sub-section 6.4.1 and 6.4.2.

The next chapter presents an assessment of individual project scores applying the weights developed in chapter 5. This attempt aims at understanding differences in the outcomes of performance evaluation made by using case analysis and the weights of the various performance indicators associated with the same projects.

Chapter Seven: Assessment of individual project scores using developed weights

7.1 Introduction

This chapter presents the outcome of the research findings related to RQ4: what are the actual performance scores of the sample of power sector PPPs applying developed weights of KPAs and indicators and how do they differ from unweighted scores derived from industry experts and/or readily available performance assessments? In particular, details on designing a questionnaire and conducting surveys on the six selected projects and details on data screening and authentication in relation to this questionnaire are discussed (Section 7.2 and 7.3). The results of the project performance scores and a detailed analysis of the weighted and unweighted project scores are presented in section 7.4 and 7.5, followed by a discussion of the results (Section 7.6). Appendix 1 includes tables A1 to A7.

7.2 Data collection: Questionnaire design and survey conduct

Data collection in this stage is an extension of the data collection of the first phase, which was for developing the weights for the KPAs and indicators (chapter 5). In this stage, the same six power projects used for the case study analysis in chapter six are considered: their performances are assessed by applying the previously developed weights. The questionnaires are designed to obtain a perception of respondents regarding specific projects using thirty-seven indicators particularly relevant for the power sector PPPs in Bangladesh. These indicators have been categorised broadly into eight KPAs, based on their performance area. Project-specific respondents are asked to score the performance of their project, based on their personal experiences and on actual information about the projects, against each of the indicators listed in the questionnaire (see full questionnaire in the appendix 5). Follow-up discussion with the respondents to clarify any ambiguous answer allowed modification where necessary. Their perception of project performance is considered to be acceptable, given that historical information on performances against a range of indicators used in this survey is unavailable and sensitive to open publication.

7.3 Data screening and authentication

Data collected through project-specific surveys has carefully been screened and validated. Out of the thirty-seven indicators listed in the questionnaire, the five (standardised contract, relationship dilemmas, government liabilities, disclosure of project information, efficient risk management) that had one or more missing responses against a project have been dropped. The responses for the remaining thirty-two indicators are considered to be acceptable for analysis

Responses were verified by the researcher with an assessment made from analysing available public documents (e.g., Annual reports, World Bank and ADB reports) related to the particular projects and from commentaries reported in the media. Those responses that seemed to contradict the available assessment, based on the documents and commentaries of a particular project, were redirected to the respondents. After follow-up discussion regarding available assessment on a particular indicator or project from other sources, they were requested to modify their responses, or to justify their original rating.

7.4 Calculating project performance scores

Likert scaled scores obtained for each of the indicators are multiplied by their corresponding weights (chapter 5) to determine the normalised weighted scores for each of the indicators. The average normalised weighted scores for the KPAs are then derived by averaging the weighted scores of the indicators that belong to each KPA. Finally, the average normalised weighted scores for each of the six projects are derived by averaging the weighted scores of the eight KPAs for the project in question. Both the unweighted and the weighted scores of the KPAs and indicators are presented in table 7.1. Details of the individual calculation for each of the six projects are listed in Appendix 1 (see table A1 to table A6 in Appendix 1).

Table 7. 1: Unweighted and weighted scores of six projects by KPAs and indicators

		HPL		KPCL		DNPGL		DSPGL		B-R		H412	
KPA/IND	**Nw**	**UnS**	**WS**	**UnS**	**WS**	**UnS**	**WS**	**UnS**	**WS**	**UnS**	**WS**	**UnS**	**WS**
PI	**0.0404**	**7.00**	**0.2825**	**7.00**	**0.2825**	**4.80**	**0.1949**	**5.20**	**0.2108**	**5.80**	**0.2355**	**5.20**	**0.2133**
NA	0.0386	7.00	0.2703	7.00	0.2703	4.00	0.1545	6.00	0.2317	6.00	0.2317	5.00	0.1931
SO	0.0286	7.00	0.2005	7.00	0.2005	4.00	0.1146	5.00	0.1432	6.00	0.1718	6.00	0.1718
IA	0.0395	7.00	0.2764	7.00	0.2764	5.00	0.1974	6.00	0.2369	6.00	0.2369	5.00	0.1974
FA	0.0622	7.00	0.4351	7.00	0.4351	5.00	0.3108	5.00	0.3108	6.00	0.3729	6.00	0.3729
PIT	0.0329	7.00	0.2301	7.00	0.2301	6.00	0.1972	4.00	0.1315	5.00	0.1644	4.00	0.1315
T	**0.0341**	**7.00**	**0.2386**	**6.33**	**0.2149**	**6.33**	**0.2160**	**5.67**	**0.1922**	**5.67**	**0.1942**	**6.00**	**0.2046**
ECS	0.0310	7.00	0.2167	7.00	0.2167	6.00	0.1857	6.00	0.1857	5.00	0.1548	6.00	0.1857
SCM	0.0370	7.00	0.2588	6.00	0.2218	6.00	0.2218	5.00	0.1849	6.00	0.2218	6.00	0.2218
FT	0.0344	7.00	0.2405	6.00	0.2061	7.00	0.2405	6.00	0.2061	6.00	0.2061	6.00	0.2061
CO	**0.0253**	**6.00**	**0.1517**	**6.20**	**0.1555**	**5.60**	**0.1441**	**5.60**	**0.1399**	**5.20**	**0.1304**	**4.80**	**0.1249**
C	0.0201	6.00	0.1203	6.00	0.1203	6.00	0.1203	6.00	0.1203	6.00	0.1203	5.00	0.1003
TC	0.0190	6.00	0.1141	7.00	0.1331	5.00	0.0951	5.00	0.0951	5.00	0.0951	5.00	0.0951
Q	0.0399	6.00	0.2393	6.00	0.2393	6.00	0.2393	5.00	0.1994	5.00	0.1994	6.00	0.2393
LCM	0.0281	6.00	0.1689	6.00	0.1689	6.00	0.1689	6.00	0.1689	5.00	0.1407	4.00	0.1126
DS	0.0193	6.00	0.1159	6.00	0.1159	5.00	0.0966	6.00	0.1159	5.00	0.0966	4.00	0.0773
SP	**0.0226**	**6.40**	**0.1445**	**6.40**	**0.1454**	**5.40**	**0.1222**	**5.40**	**0.1222**	**5.40**	**0.1213**	**5.80**	**0.1304**
TR	0.0177	7.00	0.1236	6.00	0.1060	5.00	0.0883	5.00	0.0883	6.00	0.1060	6.00	0.1060
PrKS	0.0252	6.00	0.1512	7.00	0.1764	6.00	0.1512	6.00	0.1512	5.00	0.1260	5.00	0.1260
PuCC	0.0240	6.00	0.1438	6.00	0.1438	5.00	0.1198	5.00	0.1198	5.00	0.1198	6.00	0.1438
PRR	0.0215	6.00	0.1291	6.00	0.1291	6.00	0.1291	6.00	0.1291	5.00	0.1076	6.00	0.1291
PrS	0.0246	7.00	0.1719	7.00	0.1719	5.00	0.1228	5.00	0.1228	6.00	0.1474	6.00	0.1474
F	**0.0497**	**6.33**	**0.3146**	**6.33**	**0.3130**	**5.33**	**0.2670**	**5.67**	**0.2834**	**5.33**	**0.2648**	**5.33**	**0.2610**
ORA	0.0557	6.00	0.3342	6.00	0.3342	6.00	0.3342	6.00	0.3342	5.00	0.2785	4.00	0.2228
FC	0.0444	7.00	0.3110	7.00	0.3110	5.00	0.2222	5.00	0.2222	5.00	0.2222	6.00	0.2666
PG	0.0490	6.00	0.2938	6.00	0.2938	5.00	0.2448	6.00	0.2938	6.00	0.2938	6.00	0.2938
TA	**0.0533**	**6.67**	**0.3556**	**6.67**	**0.3529**	**5.33**	**0.2866**	**4.33**	**0.2302**	**5.00**	**0.2665**	**5.00**	**0.2705**
IL	0.0484	7.00	0.3387	7.00	0.3387	5.00	0.2419	4.00	0.1935	5.00	0.2419	4.00	0.1935
LCEM	0.0605	6.00	0.3627	6.00	0.3627	6.00	0.3627	4.00	0.2418	5.00	0.3023	6.00	0.3627
RC	0.0511	7.00	0.3574	7.00	0.3574	5.00	0.2553	5.00	0.2553	5.00	0.2553	5.00	0.2553
SS	**0.0097**	**6.00**	**0.0582**	**6.67**	**0.0652**	**5.67**	**0.0554**	**6.00**	**0.0585**	**6.00**	**0.0585**	**6.00**	**0.0585**
MO	0.0095	6.00	0.0568	7.00	0.0662	6.00	0.0568	6.00	0.0568	6.00	0.0568	6.00	0.0568
VFM	0.0106	7.00	0.0745	7.00	0.0745	6.00	0.0639	6.00	0.0639	6.00	0.0639	6.00	0.0639
P	0.0091	5.00	0.0456	6.00	0.0547	5.00	0.0456	6.00	0.0547	6.00	0.0547	6.00	0.0547

SED	**0.0237**	**6.80**	**0.1612**	**6.20**	**0.1472**	**5.00**	**0.1172**	**5.00**	**0.1189**	**5.80**	**0.1370**	**5.60**	**0.1326**
PSD	0.0250	7.00	0.1751	6.00	0.1501	4.00	0.1001	5.00	0.1251	6.00	0.1501	5.00	0.1251
IPS	0.0161	7.00	0.1128	6.00	0.0967	5.00	0.0806	4.00	0.0645	6.00	0.0967	6.00	0.0967
ID	0.0293	7.00	0.2051	6.00	0.1758	4.00	0.1172	4.00	0.1172	6.00	0.1758	6.00	0.1758
EG	0.0223	6.00	0.1340	6.00	0.1340	6.00	0.1340	6.00	0.1340	6.00	0.1340	5.00	0.1116
EF	0.0257	7.00	0.1796	7.00	0.1796	6.00	0.1540	6.00	0.1540	5.00	0.1283	6.00	0.1540
Average score		**6.53**	**0.2059**	**6.47**	**0.2028**	**5.38**	**0.1677**	**5.34**	**0.1641**	**5.53**	**0.1710**	**5.44**	**0.1684**

Notes:

Projects in the various columns: HPL—360MW Haripur Power Ltd; KPCL—110MW Khulna Power Company Ltd; DNPGL—55MW Dhaka North Power Generation Ltd; DSPGL—55MW Dhaka South Power Generation Ltd; B-R—150MW B-R Powergen Ltd; H412—412MW Haripur Power Plant. **Nw—**Normalised weights; **UwS—**Unweighted scores; **WS—**Weighted scores.

KPAs in the various rows: PI: Planning and initiation; T: Tendering CO: Construction and operation; SP: Sustainability of partnerships F: Financing; TA: Transparency and accountability SS: Stakeholders satisfaction; SED: Socioeconomic development.

Indicators in the various rows: NA—Needs assessment; SO—SMART Objectives; IA—Implementability assessment; FA—Feasibility analysis; PIT—Public interest test; ECS—Efficient concessionaire selection; SCM—selection criteria and method; FT—Fairness and transparency; C—Cost consideration; TC—Time consideration; Qs—Quality of assets; LCM—Life cycle maintainability; DS—Dispute settlement; TR—Trust and respect; PrKS—Private sector knowledge and skill; PuCC—Public Sector Capacities and Coordination; PRR—Partners roles and responsibilities; PS—Project sustainability; ORA—Optimum risk allocation; FC—Financial cost; PG—Payment guarantees; IL—Integration of locals; LCEM—Life cycle evaluation and monitoring; RC—Responsiveness of concessionaire; MO—Meeting objectives; VFM—Value for money; P—Profitability; PSD—PPP sector development; IPS—Innovation in public sector; ID—Infrastructure development; EG—Employment generation; EF—Environment friendliness.

7.5 Analysing weighted and unweighted scores of the projects

7.5.1 Weighted and unweighted scores of KPAs

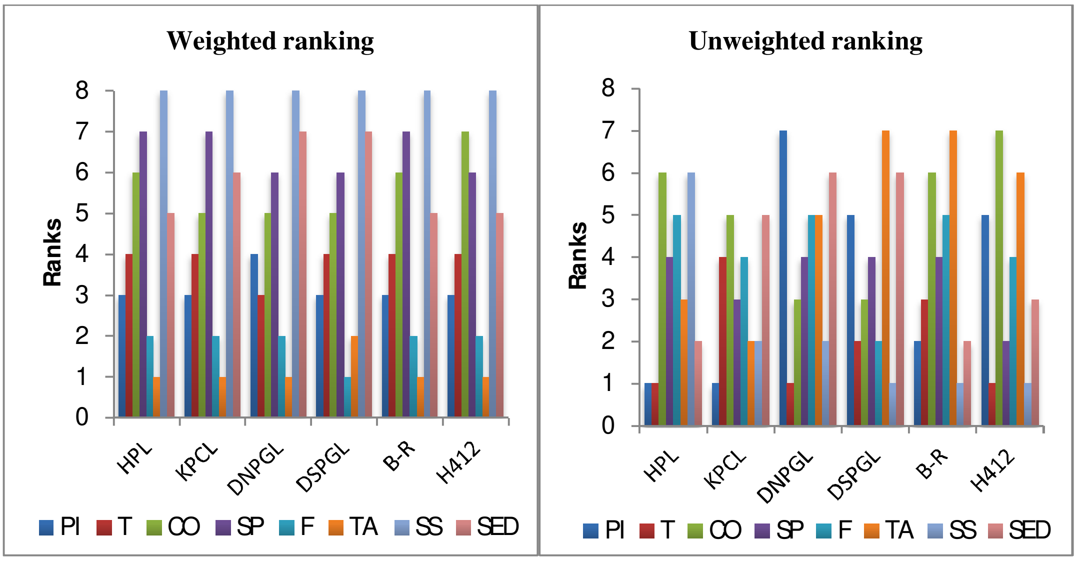
Figure 7.1, which shows some important differences between the weighted and unweighted ranks received by the KPAs, also shows the order of significance of the KPAs on impacting project performances.

360MW Haripur Power Ltd (HPL)

In the HPL, 'planning and initiation' and 'tendering' are jointly considered to be the most significant KPAs when using ranking based on the unweighted scores, but these two KPAs received third and fourth rank respectively when using rankings based on the weighted scores. This is followed by 'socioeconomic development', 'transparency and accountability', 'financing', and jointly 'stakeholder satisfaction' and 'construction and operation', based on the unweighted ranking. Based on the weighted ranking, however, the 'socioeconomic development' becomes the fifth KPA, with 'transparency and accountability' first, 'financing' second, 'stakeholder satisfaction' eighth and 'construction and operation' sixth in this project.

The relative importance (weights) of the KPAs primarily contributed to the differences in their levels of significance in this project, and in the other subsequent five projects, when the weighted rankings are used. However, the Likert scaled-based scores revealed little difference, with an average score of greater than 6 (satisfactory) received by all the KPAs, which provided an inadequate understanding of the relative significance of the KPAs compared to that of the weighted scores. Relatively better arrangement of the financing, transparency and accountability of the whole process of this project implementation (as reported in chapter 6) presents evidence for these KPAs to be relatively more significant performance areas in the HPL.

Figure 7. 1: Weighted and unweighted ranking of the six projects by KPAs



Projects: HPL—360MW Haripur Power Ltd; KPCL—110MW Khulna Power Company Ltd; DNPGL—55MW Dhaka North Power Generation Ltd; DSPGL—55MW Dhaka South Power Generation Ltd; B-R—150MW B-R Powergen Ltd; H412—412MW Haripur Power Plant.
KPAs: PI: Planning and initiation; T: Tendering CO: Construction and operation; SP: Sustainability of partnerships F: Financing; TA: Transparency and accountability SS: Stakeholders satisfaction; SED: Socio economic development.
Source: Author

110MW Khulna Power Company Ltd (KPCL)

In the KPCL, 'planning and initiation' is again considered to be the most important KPA when using the unweighted ranking but becomes third using the weighted ranking. This is followed by 'transparency and accountability' and 'stakeholder satisfaction' jointly in second, 'sustainability of partnerships' third, 'tendering' and 'financing' jointly fourth and 'construction and operation' and 'socioeconomic development' jointly fifth using the unweighted ranking. With the weighted ranking, 'transparency and accountability' is considered to be the most significant KPA in this project while 'stakeholder satisfaction' becomes the least significant one.

As for the HPL, the weights of the KPAs for the KPCL are considered to be the major cause of the differences between the weighted and unweighted scores, and hence the differences in their levels of importance. Further, since this project was duly financed by the International Finance Corporation (IFC), along with other commercial lenders, it has better disclosure of information on its websites and on other publicly available sources, and was well-planned. These features are associated with the ‘financing’, ‘transparency and accountability’, and ‘planning and initiation’ areas. So they were ranked with a relatively higher importance. However, the unweighted scores represent an inaccurate picture of the relative importance of the KPAs, whereas the weighted system provided an improved understanding of their relative significance.

55MW Dhaka North Power Generation Ltd (DNPGL)

In the DNPGL, ‘tendering’ based on the unweighted ranking is considered to be the most significant KPA, followed in order by ‘stakeholder satisfaction’, ‘construction and operation’, ‘sustainability of partnerships’, then jointly ‘financing’ and ‘transparency and accountability’, then ‘socio economic development’ and lastly ‘planning and initiation’. Here, ‘tendering’ becomes the third and ‘stakeholder satisfaction’ becomes the least significant KPA, based on the weighted ranking. The KPA ‘transparency and accountability’ is perceived to be the most important when using the weighted ranking, followed by KPA ‘financing’ as the second most important in this project.

Beyond the common reasons (i.e., the weights of the KPAs) contributing to the differences in the weighted and unweighted rankings of the KPAs, the specific cause was related to the innovative financing arrangement for this project. The weighted system of the KPAs provided a better understanding of their relative significance.

55MW Dhaka South Power Generation Ltd (DSPGL)

In the DSPGL, the KPA ‘stakeholder satisfaction’, perceived to be most important based on the unweighted ranking, is followed by (jointly) ‘tendering’ and ‘financing’, then (in order) ‘construction and operation’, ‘sustainability of partnerships’, ‘planning and initiation’, ‘socioeconomic development’, and ‘transparency and accountability’. In contrast, when the weighted ranking is used, the KPA ‘stakeholder satisfaction’ is considered to be the least important in this project while the KPA ‘financing’ is the most important.

The causes described for the DNPGL are also applicable in this project to explain the reasons for the differences between the weighted and unweighted rankings of the KPAs, because these two projects have commonalities in ownership, size and implementation period.

150MW B-R Powergen Ltd (B-R)

As with the DSPGL, ‘stakeholder satisfaction’ is the most significant KPA in the B-R Powergen Ltd, based on the unweighted ranking, but is the least important based on the weighted ranking. The KPAs ‘planning and initiation’ and ‘socio economic development’ become equally second most important, followed in order by ‘tendering’, ‘sustainability of partnerships’, ‘financing’, ‘construction and operation’ and ‘transparency and accountability’, based on the unweighted ranking. However, in the weighted ranking, both KPA ‘planning and initiation’ and ‘socio economic development’ moved downwards, but KPA both ‘financing’ and ‘transparency and accountability’ moved upwards in terms of their significance.

Again, the weights of the KPAs are also the major causes of the differences in the weighted and unweighted rankings in this project, and the next, which are both operated by public sector entities. In this project, both the weighted and unweighted rakings gave an equal level of significance to the ‘construction and operation’ area.

412MW Haripur Power Plant (H412)

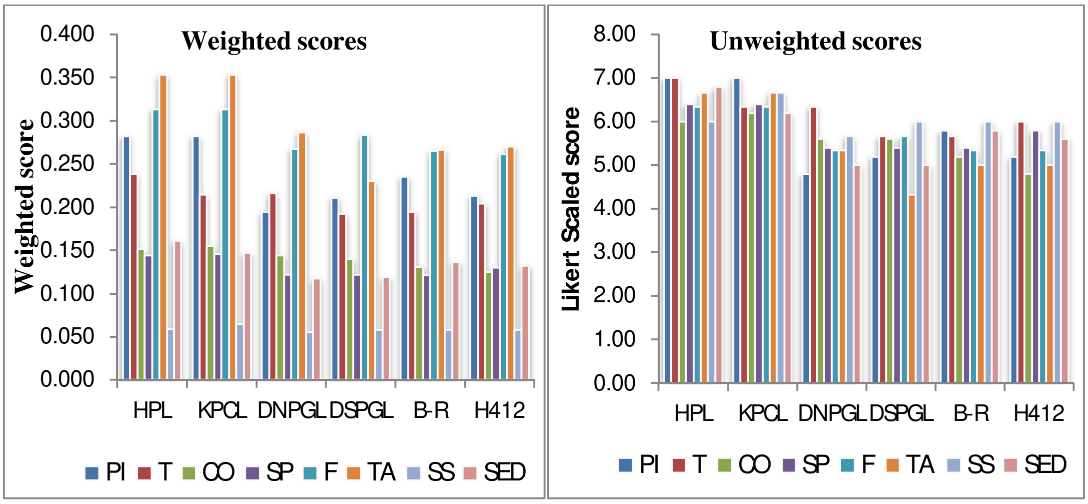
Finally, ‘tendering’ and ‘stakeholder satisfaction’, jointly considered to be the most significant KPAs based on the unweighted ranking; moved downwards with respect to their significance when using the weighted ranking. ‘Sustainability of partnerships’, ‘socioeconomic development’, ‘financing’, ‘planning and initiation’, ‘transparency and accountability', and 'construction and operation' follow in order of significance, based on the unweighted ranking. Based on the weighted ranking, the KPAs 'sustainability of partnerships', 'socioeconomic development' and 'construction and operation' also moved downward, but the KPAs 'financing', 'planning and initiation', and 'transparency and accountability' moved upwards with respect to their significance. Accordingly, the KPA 'transparency and accountability', based on the weighted ranking, is perceived to be most important. Followed by 'financing' second and 'planning and initiation' third in this project.

The causes already given for B-R Powergen Ltd for the differences in the relative importance of the KPAs are applicable for this project as well, since both these projects, which have similar features, are developed and operated by public sector entities.

This analysis suggests that 'transparency and accountability' and 'financing' are consistently perceived to be the most significant for measuring performances in all of the six projects when the weighted ranking is used, but seem to be less significant KPAs in all projects when the unweighted ranking is used. This is because of the impact of the weights (relative importance) of the KPAs. The KPAs that include 'stakeholder satisfaction', 'sustainability of partnerships', and 'socioeconomic development' all moved downward in order of their significance in all of the projects when the weighted ranking is used.

The perception based on the Likert scale might lead to a misunderstanding of the relative significance of the KPAs because the average scores obtained by using the Likert scale for the KPAs and for all of the projects are in an upper level of this scale. However, using the weights of the KPAs can offer improved understanding of their relative importance, as clearly demonstrated in figure 7.2. For example, the KPA 'stakeholder satisfaction' received a score of around 6 using a Likert scale but received a minimum weighted score (around 0.05) in all the projects (see the weighted scores in figure 7.2). This clearly shows a sharp fall in the order of importance when the weighted scores are used. A sensitivity analysis based on the performance experiences documented in chapter six provides a better understanding of the impact of decreasing the Likert scaled scores for each project (see sub-section 7.5.4).

Figure 7. 2: Pattern of weighted and unweighted scores of the six projects by KPAs



Projects: HPL—360MW Haripur Power Ltd; KPCL—110MW Khulna Power Company Ltd; DNPGL—55MW Dhaka North Power Generation Ltd; DSPGL—55MW Dhaka South Power Generation Ltd; B-R—150MW B-R Powergen Ltd; H412—412MW Haripur Power Plant.
KPAs: PI: Planning and initiation; T: Tendering CO: Construction and operation; SP: Sustainability of partnerships F: Financing; TA: Transparency and accountability SS: Stakeholder satisfaction; SED: Socioeconomic development.
Source: Author

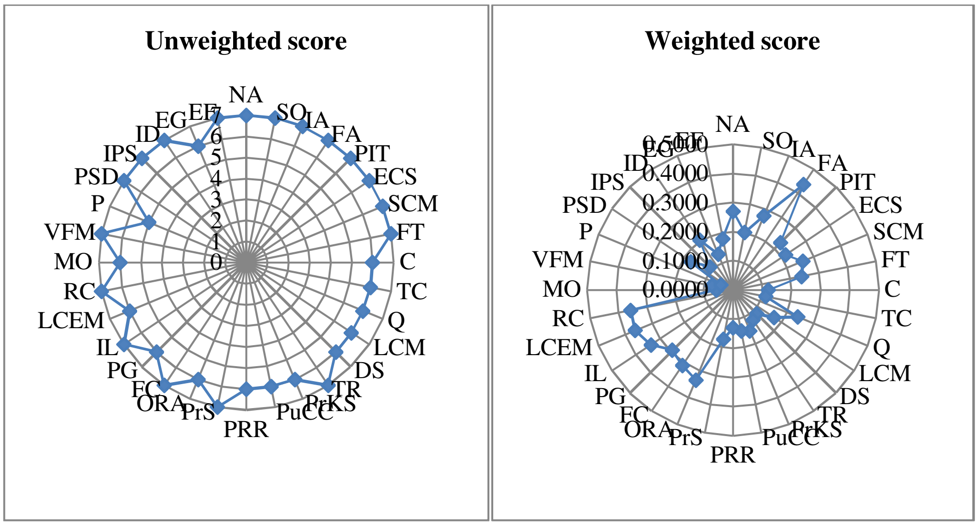
7.5.2 Weighted and unweighted scores of indicators

All six projects are considered together when analysing the weighted and unweighted scores of the indicators. A comparison between them has been made across the six projects (HPL, KPCL, DNPGL, DSPGL, B-R, and H412); the outcomes of the analysis are presented in figures 7.3 to 7.8.

Two distributions can be observed in these figures, one on the unweighted scores of the indicators and the other on the weighted scores (see weighted and unweighted scores, figures 7.3 to 7.8). The distribution of the unweighted scores demonstrates that most of the indicators received high scores in all of the projects. However, the distribution of the weighted scores shows that some indicators (i.e., ‘value for money’, ‘meeting objectives’, ‘innovation in public sector’, ‘trust and respect’, ‘project sustainability’, and ‘PPP sector development’) received very low weighted scores but obtained higher unweighted scores. In other words, these higher scoring indicators could not have maintained such a sequence in the weighted scoring system. This means that the order of importance of the indicators changes substantially when their relative significance is used in deriving their scores.

Graphs based on the weighted scores demonstrated a consistent pattern in the order of the relative significance of some indicators, irrespective of their higher or lower scores obtained from using the Likert scale. This group (e.g., ‘life cycle evaluation and monitoring’, ‘optimal risk allocation’, ‘payment and government guarantees’, ‘quality of assets’, ‘feasibility analysis’, ‘integration of locals’, ‘financial cost’, and ‘responsiveness of concessionaire’) showed a consistency in obtaining higher weighted scores in all of the projects but could not secure higher unweighted scores. This consistency might also be explained as being an impact of the relative importance (weights) of the indicators.

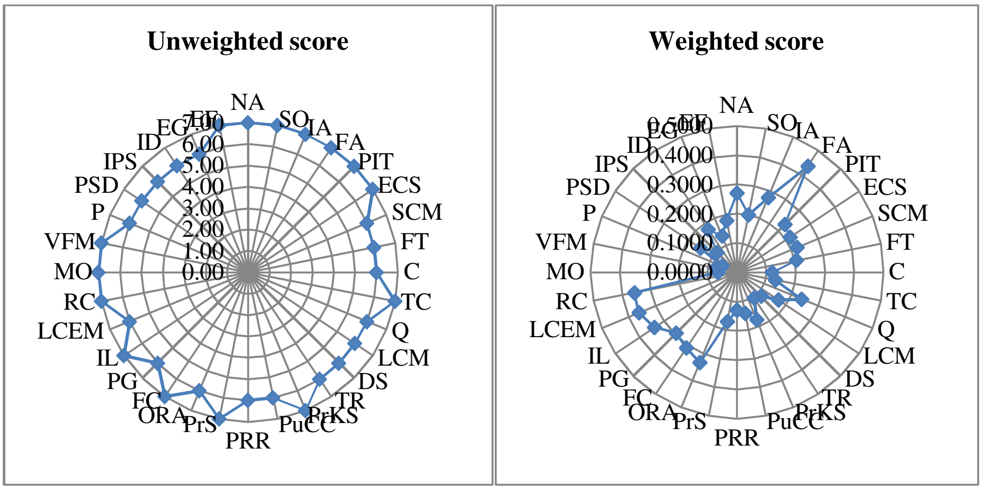
Figure 7. 3: Unweighted and weighted scores of the indicators in HPL



Indicators: NA—Needs assessment; SO—SMART Objectives; IA—Implementability assessment; FA—Feasibility analysis; PIT—Public interest test; ECS—Efficient concessionaire selection; SCM—selection criteria and method; FT—Fairness and transparency; C—Cost consideration; TC—Time consideration; Qs—Quality of assets; LCM—Life cycle maintainability; DS—Dispute settlement; TR—Trust and respect; PrKS—Private sector knowledge and skill; PuCC—Public Sector Capacities and Coordination; PRR—Partners roles and responsibilities; PrS—Project sustainability; ORA—Optimum risk allocation; FC—Financial cost; PG—Payment guarantees; IL—Integration of locals; LCEM—Life cycle evaluation and monitoring; RC—Responsiveness of concessionaire; MO—Meeting objectives; VFM—Value for money; P—Profitability; PSD—PPP sector development; IPS—Innovation in public sector; ID—Infrastructure development; EG—Employment generation; EF—Environment friendliness

Source: Author

Figure 7. 4: Unweighted and weighted scores of the indicators in KPCL



Source: Author

Figure 7. 5: Unweighted and weighted scores of the indicators in DNPGL

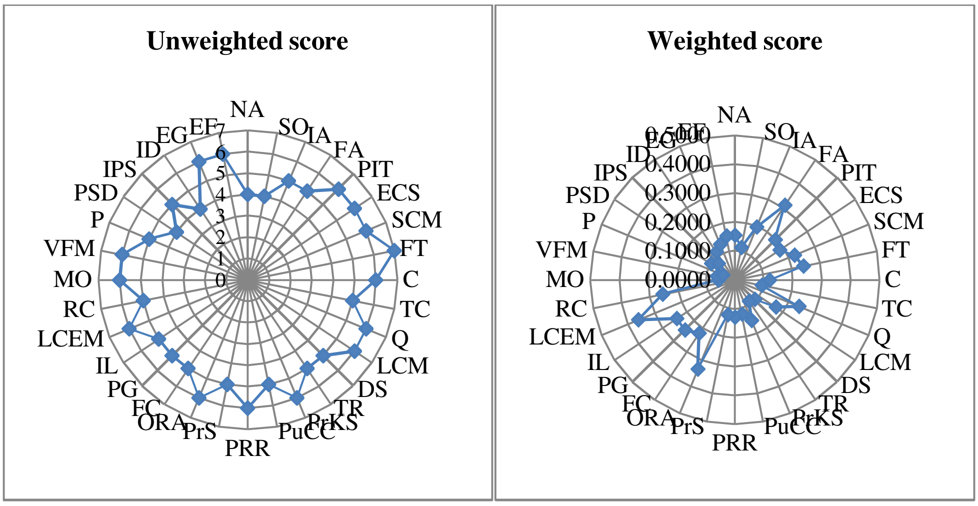


Figure 7. 6: Unweighted and weighted scores of the indicators in DSPGL

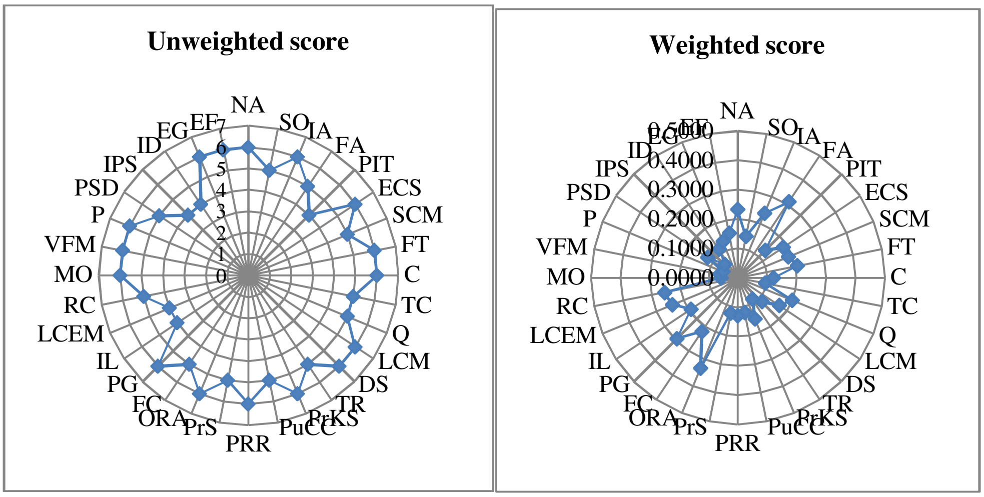
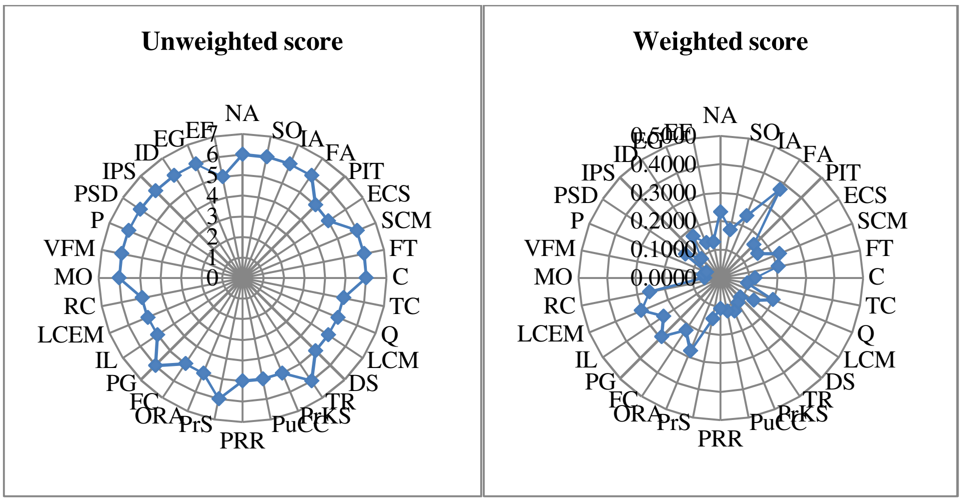
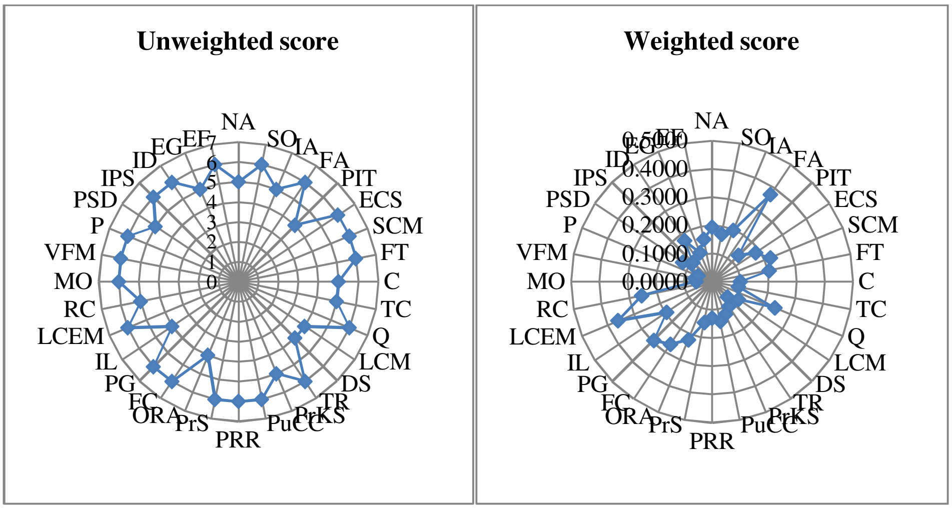


Figure 7. 7: Unweighted and weighted scores of the indicators in B-R



Source: Author

Figure 7. 8: Unweighted and weighted scores of the indicators in H412

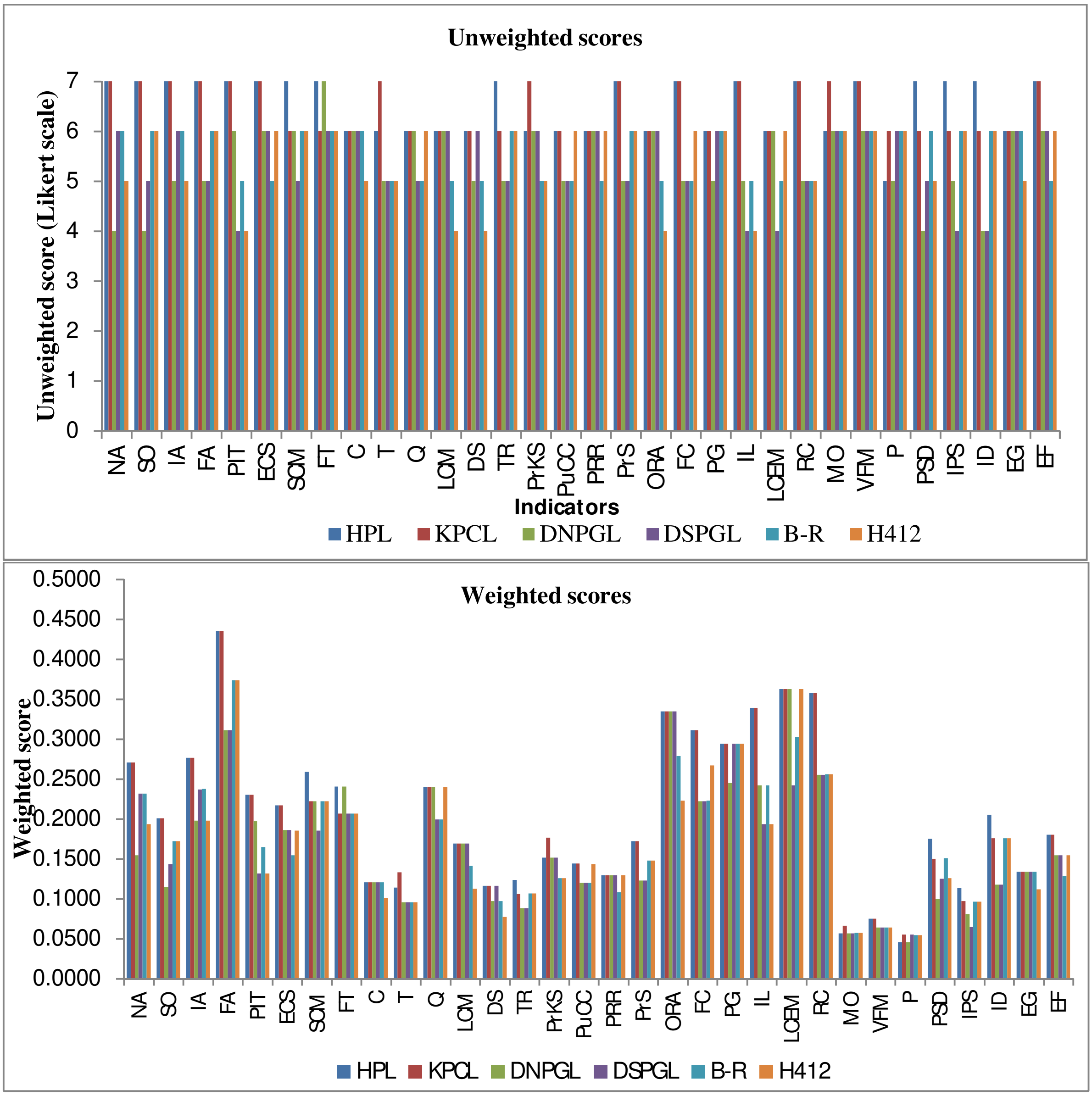


Source: Author

In B-R, the indicators are considered to be either satisfactorily important (score 6) or less than satisfactory (5) when a Likert scale is used, but no indicator is perceived to be less than this (a score of 5). However, a further dispersion is observable in the distribution (see figures 7.5, 7.6 and 7.8) of the unweighted scores in the DNPGL, DSPGL, and H412. In these projects, at least four different indicators received a score of 4, which means they are considered of average importance in measuring the project performances. The remaining indicators received scores of either 6 or 7. However, the indicators in all four of these projects achieved lower weighted scores than the two highest performing projects (HPL and KPCL).

As with the unweighted scores of the KPAs, the unweighted scores of the indicators might also lead to a misunderstanding of the relative significance of the indicators. Figure 7.9 presents two patterns of the weighted and unweighted scores. The least variation on the distribution of the unweighted scores of the indicators can be noticed in the unweighted scores, which indicates the closeness of the unweighted scores among the indicators. However, a clear variation is observable in the distribution of the weighted scores.

Figure 7. 9: Pattern of unweighted and weighted scores of the indicators in six projects



Projects in the legend: HPL—360MW Haripur Power Ltd; KPCL—110MW Khulna Power Company Ltd; DNPGL—55MW Dhaka North Power Generation Ltd; DSPGL—55MW Dhaka South Power Generation Ltd; B-R—150MW Powergen Ltd; H412—412MW Haripur Power Plant.

Source: Author

Using the weights of the indicators can improve the understanding of their relative importance. For example, figure 7.9 shows that the indicators 'cost', 'meeting objectives', 'value for money', and 'environmental friendliness' received a score of more than 6 in all of the projects using the Likert scale but received a minimum weighted score of less than 0.150.

7.5.3 Overall scores of the projects

After the analysis of the KPAs and indicators has been undertaken individually, a comparative analysis based on the overall project scores is needed to understand the performance of each of the projects. The HPL and KPCL received higher overall weighted scores of 0.2059 and 0.2028 respectively. The individual scores of the KPAs and indicators of these two are also higher, compared to the other four projects (DNPGL, DSPGL, B-R, and H412). In other words, these two projects seem to be the best performers out of the six.

Of the remaining four, the B-R and H412 are operated by the public sector organisations under the same government policies that are applicable to the power sector PPPs. However, these two (B-R with an overall score of 0.1710; H412, with 0.1684) appear to be better performers, based on the overall scores of the projects, than the other two projects (DNPGL and DSPGL), which are operated by purely private sponsors. The DNPGL has the overall score of 0.1677; the DSPGL has the lowest overall score of 0.1641 among the six. The details of their unweighted and weighted scores can be found in table 7.1. Although both the weighted and unweighted scores have an identical order of significance for the six projects, with respect to their performances, the weighted scores show a significant difference for the KPAs and indicators in their ranking.

7.5.4 Sensitivity analysis:

A sensitivity analysis with a systematic approach was performed to check the robustness of the results and to better understand the impact of the changes in the Likert scaled scores for each project. These Likert scores are provided by the project-specific respondents (representatives of the projects), who are affiliated with the interests of their particular projects, and who are therefore likely to provide higher scores for the rating of those projects. Pre-defined criteria (performance objectives) documented in the analysis of the case study in chapter six are used to reduce the Likert scaled scores in order to explore their sensitivity to the weighted scores that were associated with the KPAs, indicators and individual projects.

The following two assumptions are made:

(a) Project-specific respondents generally gave higher Likert scaled scores for their affiliated projects and therefore, these scores are required to be reduced.

(b) Performance objectives/indicators under the KPAs are considered to be either fulfilled, partially fulfilled or unfulfilled. The objectives fulfilled are not considered for sensitivity analysis because their fulfilment suggests satisfactory performances. However, if an objective/indicator in any KPA is unfulfilled, the corresponding score is fixed at 2 (dissatisfactory) where the worst level is 1 (highly dissatisfactory), and if an objective/indicator is partially fulfilled, the corresponding score is 4 (average). The highest score in the 1-7 Likert scale used in this survey is 7 (highly satisfactory).

The KPA-wise performance objectives or indicators in the different projects, which are based on these assumptions, are summarised in table 7.2. The objectives are either unfulfilled (**x**) with a corresponding score of 2 (dissatisfactory) or partially fulfilled (ϕ) with a corresponding score of 4 (average).

Table 7. 2: Performance objectives used to reduce unweighted scores

KPAs	Projects (Outcomes)	Notes on performance objectives
Socioeconomic development	HPL (ϕ)	Contributed to the long-term economic development by generating power and employment, but it is difficult to reach conclusions on the long-run consequences without further empirical analysis.
Socioeconomic development	KPCL (ϕ)	Contributed to the long-term economic development by generating power and employment, and to capital market development by drawing equity from the capital market. However, it is difficult to reach conclusions on the long-term consequences without further empirical analysis.
Planning and initiation	DNPGL (ϕ)	Project land could not be provided as per the agreement, which might be the consequence of an inadequate feasibility study, but the project was ultimately implemented.
Construction and operation	DNPGL (ϕ)	Completed on US$ 4 million above its contract agreement and 15 months behind schedule but has been in operation since 2016.
Stakeholder satisfaction	DNPGL (ϕ)	Contribution to power generation (0.41 percent in 2017), access to innovative financing etc. were some of the satisfying indicators. In contrast, cost overruns and delay were dissatisfying factors.
Socioeconomic development	DNPGL (ϕ)	Contributed to the long-term economic development by generating power and employment, and to capital market development by drawing equity from the capital market; However, it is difficult to conclude on the long-term consequences without further empirical analysis.
Construction and operation	DSPGL (ϕ)	Completed US$ 2 m above its contract agreement and 14 months behind schedule, but has been in operation since 2016
Stakeholder satisfaction	DSPGL (ϕ)	Contribution to power generation (0.41 percent in 2017), access to innovative financing etc. were some indicators for stakeholders to be satisfied. In contrast, the cost overruns, the delay in implementation, and the environmental concerns in nearby areas were some dissatisfying factors
Socioeconomic development	DSPGL (ϕ)	Contributed to the long-term economic development by generating power and employment, and to capital market development by drawing equity from the capital market, but it is difficult to reach conclusions on long-term consequences without further empirical analysis
Tendering	B-R and H412 **(x)**	Non-competitive tendering (unsolicited proposals) was used to award the contracts to state-owned companies (B-R Powergen Ltd and Electricity Generation Company of Bangladesh)
Construction and operation	B-R and H412 (ϕ)	B-R was completed on Engineering, Procurement and Construction (EPC) contract on-budget but 6 months behind schedule. H412 was completed below its contracted budget, but 9 months behind schedule. However, it has been in operation since 2015.
Sustainability of partnerships	B-R and H412 **(x)**	These projects are not public-public partnerships, and thus do not meet this KPA (sustainability of partnerships).
Transparency and accountability	B-R and H412 (ϕ)	Using competitive tendering (in EPC contract) suggested relatively better transparency in the initial procurement. However, since these are not PPPs, the private participation is absent here, and thus they seem to be less transparent.
Stakeholdes satisfaction	B-R and H412 (ϕ)	Contribution to power generation (1.19 and 5 percent in 2017), access to innovative financing etc. and under-budget construction (H412) were some satisfying factors; the delay in implementation was a dissatisfying factor.
Socioeconomic development	B-R and H412 (ϕ)	Contributed to the long-term economic development by generating power and employment. However, efficiency gains appeared to be compromised considering the lack of competitiveness in selecting the concessionaire.

Notes: (ϕ)—Performance objective partially fulfilled = Average performance (score 4); **x**—Performance objective not fulfilled = Dissatisfactory (score 2).
Likert scale used: 1=Highly dissatisfactory; 2=Dissatisfactory; 3= Less than dissatisfactory; 4=Average performance; 5= Less than satisfactory; 6= Satisfactory and 7=Highly satisfactory.
Source: Author

Table 7.3 presents a summary of the results of the sensitivity analysis. Detailed results, with the scores of the performance objectives/indicators, are presented in table A7 (Appendix 1). The sensitivity analysis confirmed that the HPL ranked highest (with a weighted score of 0.1955) and that the KPCL ranked next highest (with a score of 0.1946), meaning that both of them are the best performing power projects (independent power producers), but with a sharp difference in their weighted scores. However, the analysis found that the DSPGL and DNPGL, two privately operated power projects, outperformed the other two publicly operated ones (B-R and H412). In the analysis, the Likert scores of some of the performance objectives/indicators were downgraded for their partial fulfilment or fulfilment based on the objective evidence summarised in table 7.2, which were otherwise unreflected in the perceptions given by the project affiliated respondent.

Table 7. 3: Results summary of sensitivity analysis by KPAs

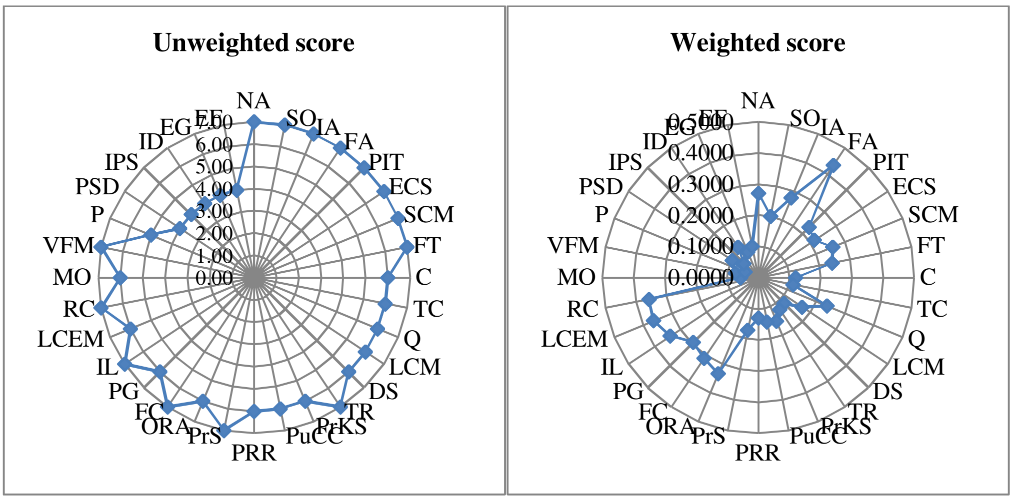
KPAs	Nw	HPL		KPCL		DNPGL		DSPGL		B-R		H412	
		Rs	**Ws**	**Rs**	**Ws**	**Rs**	**Ws**	**Rs**	**Ws**	**Rs**	**Ws**	**Rs**	**Ws**
(PI) Planning and initiation	0.0404	7.00	0.2825	7.00	0.2825	*4.00*	0.1614	5.20	0.2108	5.80	0.2355	5.20	0.2133
(T) Tendering	0.0341	7.00	0.2386	6.33	0.2149	6.33	0.2160	5.67	0.1922	*2.00*	0.0682	*2.00*	0.0682
(CO) Construction and operation	0.0253	6.00	0.1517	6.20	0.1555	*4.00*	0.1011	*4.00*	0.1011	*4.00*	0.1011	*4.00*	0.1011
(SP) Sustainability of partnerships	0.0226	6.40	0.1439	6.40	0.1454	5.40	0.1222	5.40	0.1222	*2.00*	0.0452	*2.00*	0.0452
(F) Financing	0.0497	6.33	0.3130	6.33	0.3130	5.33	0.2670	5.33	0.2670	5.33	0.2648	5.33	0.2610
(TA) Transparency and accountability	0.0533	6.67	0.3529	6.67	0.3529	5.33	0.2866	4.33	0.2302	*4.00*	0.2132	*4.00*	0.2132
(SS) Stakeholder satisfaction	0.0097	6.00	0.0590	6.67	0.0652	*4.00*	0.0390	*4.00*	0.0390	*4.00*	0.0390	*4.00*	0.0390
(SED) Socioeconomic development	0.0237	*4.00*	0.0947	*4.00*	0.0947	*4.00*	0.0947	*4.00*	0.0947	*4.00*	0.0947	*4.00*	0.0947
Total score		**6.09**	**0.1955**	**6.13**	**0.1946**	**4.69**	**0.1507**	**4.72**	**0.1509**	**3.91**	**0.1293**	**3.81**	**0.1255**

Notes:
Nw—Normalised weight**; Rs**—Reduced score; **Ws**—Weighted score; **Red coloured figures** depict reduced Likert scores.
Source: Author

The sensitivity analysis confirmed the order of importance of the KPAs measuring the performances of the six projects, with ‘transparency and accountability’ the highest scorer, followed by ‘financing’ across four of the projects. In the B-R Powergen Ltd and H412 projects, ‘financing’ ranked highest, followed by ‘planning and initiation’, and ‘transparency and accountability’ because of a change in the scores for the performance objectives remained unfulfilled or partially fulfilled.

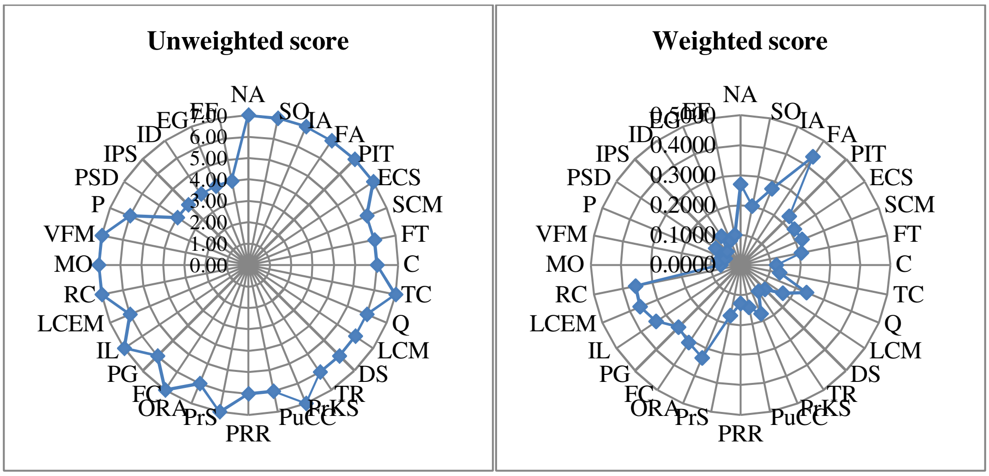
Figures 7.10 to 7.15 depict the results of the sensitivity analysis undertaken by reducing the Likert scaled scores for the indicators. A decrease in the indicators’ unweighted scores (Likert scaled) in the sensitivity analysis has an insignificant impact on their weighted scores because the weightings—but not their Likert scaled scores—have a more substantial impact on the change in their weighted scores. The reduction in the Likert scaled scores demonstrates a clearer view of the differences of the indicators in their unweighted scores across the projects, but gives a consistent pattern of three different groups of indicators, as explained earlier by their weightings.

Figure 7. 10: Unweighted (reduced) and weighted scores of the HPL



Source: Author

Figure 7. 11: Unweighted (reduced) and weighted scores of the KPCL



Source: Author

Figure 7. 12: Unweighted (reduced) and weighted scores of the DNPGL

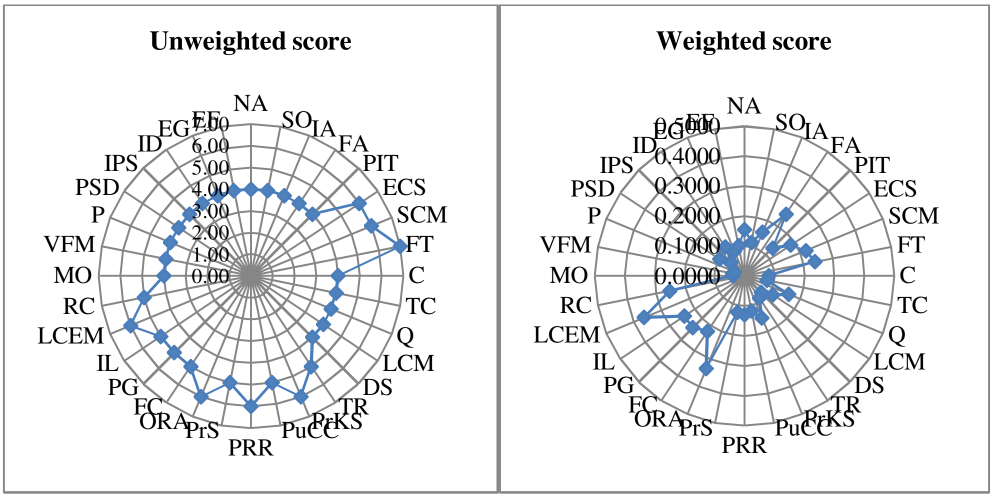
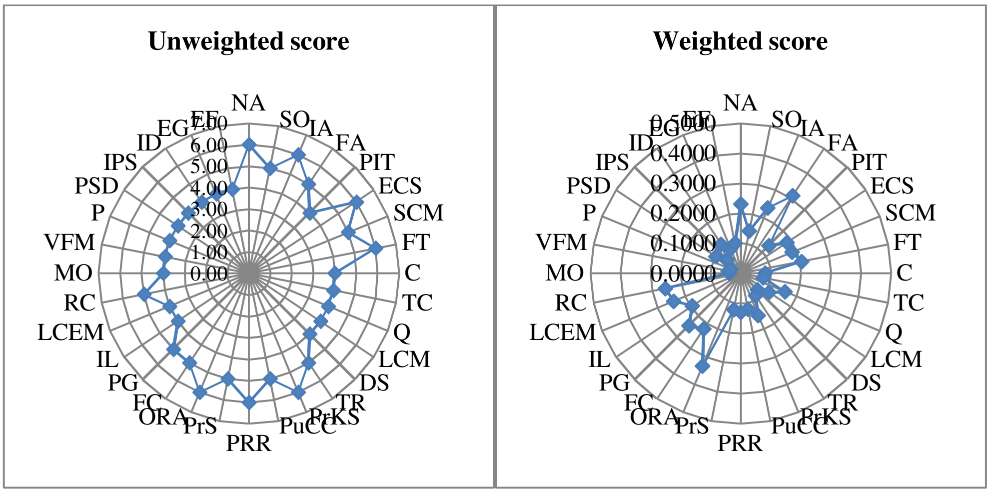
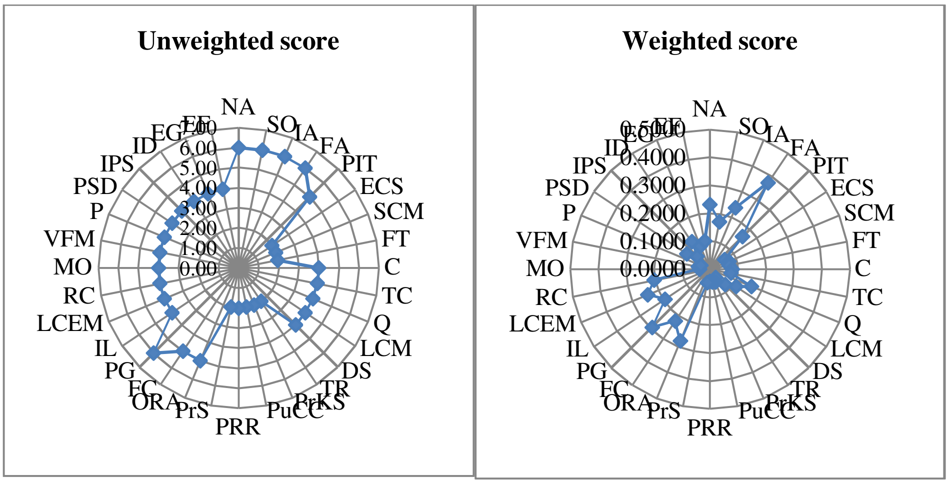


Figure 7. 13: Unweighted (reduced) and weighted scores of the DSPGL



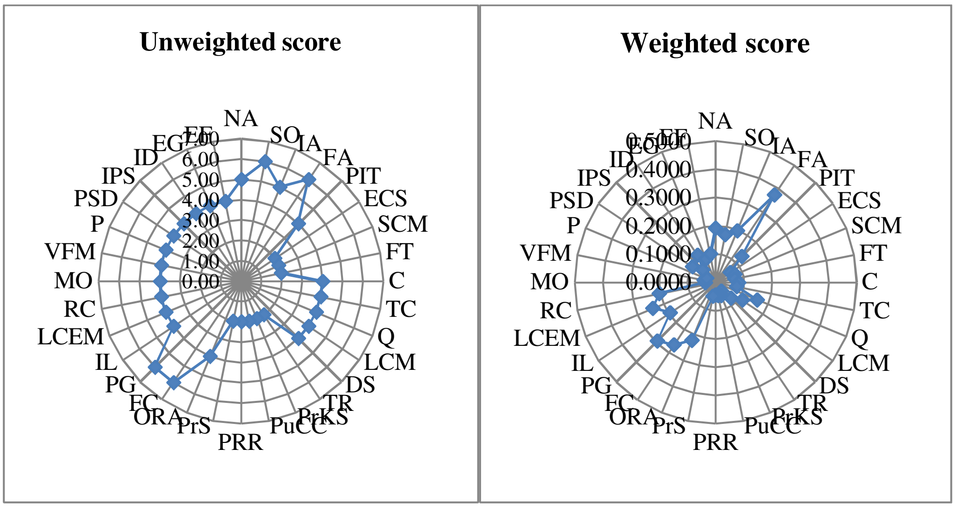
Source: Author

Figure 7. 14: Unweighted (reduced) and weighted scores of the B-R



Source: Author

Figure 7. 15: Unweighted (reduced) and weighted scores of the H412



Source: Author

7.6 Discussions and findings

The research objective addressed in this chapter has two parts: 1) to assess the actual performance scores of individual PPPs, applying developed weights of KPAs and indicators, and 2) to understand how they differ from the Likert scaled scores. To achieve this objective, the perceptions elicited from the high-level officials of the six projects on the project performances are analysed. The results suggest a number of major findings.

First, 'transparency and accountability' is considered to be the most important key performance area in all the projects except in the DSPGL, where 'financing' is the most important KPA. ‘Financing’ is the next most important KPA in all the projects, except in the DSPGL. These areas are followed, in order of significance, by KPAs ‘planning and initiation’, ‘tendering’, ‘construction and operation’, ‘socioeconomic development’, sustainability of partnerships, and ‘stakeholder satisfaction’.

Secondly, the weighted scores of KPAs and indicators differ from their unweighted scores, leading to a substantially different order of significance of KPAs in the performance assessment of the power sector PPPs in Bangladesh. Thirdly, using the weights of the KPAs and indicators can provide an improved understanding of their relative importance in assessing these power sector PPPs. Fourthly, the derived scores of the power sector PPPs seem to be related to the performance experiences of the IPP projects in Bangladesh. In the discussion of the findings relating to both the KPAs and the indicators, the six projects are considered together.

7.6.1 Relative significance of KPAs

Discussion of the eight KPAs across the six projects follows:

Transparency and accountability (TA)

The KPA ‘transparency and accountability’ is considered to be the most critical KPA in all of the projects, probably because these areas are closely linked to the issues of governance qualities common to all of the projects, since they are implemented in the same environment. Both the local (represented by the DNPGL and DSPGL) and the international sponsors (represented by the HPL and KPCL) appear to have equally recognised the importance of ‘transparency and accountability’. Furthermore, the power-sector PPPs in Bangladesh involve multi-stakeholders who have diverse organisational objectives. Achieving these objectives essentially requires greater transparency and accountability in the whole of the life cycle process of the projects.

From the experiences of the six projects, the accountability concern, in the case of Bangladesh, is evidenced in the DNPGL by the failure of the Rural Electrification Board (REB) to provide land to the concessionaire as per the land lease agreement (LLA). As a result, as documented in chapter six, the DNPGL later purchased the required land (4 acres), which delayed project implementation and escalated the project's actual cost.

Financing (F)

'Financing' is also considered to be a critical KPA for measuring performances in all of the six projects in Bangladesh. This is reflected in both the weighted and unweighted scores. Additionally, from the discussion on developing weights of the KPAs in chapter five, it is found that critical issues in Bangladesh include the missing project deadlines, the lack of timely finance for PPP projects and the huge demand for investment in infrastructures (M. Khan et al., 2012; Mamun, 2015). These issues also indicate the importance of the KPA 'financing' in Bangladesh.

However, arrangements of finance for power sector PPPs appear to be relatively easier. For example, the HPL, which reached financial closure on time, received a commitment of finances from the World Bank (IFC) and a commercial loan from international lenders. The involvement of the World Bank in this project might have provided confidence to the financiers. Similarly, the DNPGL and DSPGL also received timely financing commitment because of the support from the Investment Promotion and Financing Facility (IPFF), given by the World Bank. Without such state guarantees and the back-up from the World Bank, commercial borrowing from local banks to finance large-scale IPPs seems to be difficult in Bangladesh, as reported in chapter six (World Bank, 2015).

Planning and initiation (PI)

'Planning and initiation' is also a relatively important KPA in the selected projects, but less so than those two just discussed (TA and F). The government has short, medium and long-term perspective plans on power sector development, including a plan for engaging private sectors in power generation through the PPP option. Accordingly, the government has made policies that have substantially supported sponsors to plan and initiate IPPs. The HPL and KPCL, the two IPPs implemented early, represent ideal cases of well-planned power plants. Both of them have been developed by foreign companies from the USA (AES and Coastal Power Corporation) and Finland (Wartsila Corporation). The perception of the respective project people regarding planning and initiation, as seen via the Likert scaled scores for the HPL and KPCL on KPA PI, supported this claim of good planning that could have been made. In contrast, the DNPGL and DSPGL indicated a lack of feasibility analysis by the failure to transfer the land to the project, as reported in chapter six.

Tendering (T)

'Tendering' is also a moderately significant KPA (fourth in the ranking) in all of the projects, using both the weighted and unweighted scores. Institutional qualities of the government have an impact on the qualities of tendering practices (T. Liu et al., 2016), which are identical in all of the projects. Of the six, four projects (HPL, KPCL, DNPGL, and DSPGL) were awarded their contract through the process of competitive tendering; the remaining two (B-R and H412), through unsolicited proposals, as discussed in chapter six.

Construction and operation (CO), Sustainability of partnerships (SP) and Socio-economic development (SED)

The three KPAs (CO, SP, and SED) have a similar order of significance using both weighted and unweighted scores, whereas they are unlike with respect to their functionalities. However, the issues that include design innovation, relationship maintenance and long-term social benefits are related to these KPAs and accordingly they are more desirable to the developed countries. These complex issues require a comparatively higher level of expertise that developing countries may not have (De Jong et al., 2010; Zou et al., 2014). The analysis of the experiences from the selected projects in chapter six suggests that these issues appear to be less significant in all of the projects. Bangladesh is a developing country that has relatively fewer experiences of PPPs and thus it is supposed to have less expertise in handling the advanced issues relating to these KPAs.

Stakeholder satisfaction (SS)

'Stakeholder satisfaction' is considered to be the least significant KPA. Ensuring stakeholder satisfaction for all parties involved in the selected projects appears very difficult because of the lack of stakeholder attitudes required for implementing PPPs. Furthermore, because the scope of the rent capture is higher in Bangladesh (M. Khan et al., 2012), the project sponsors might be more concerned to win a PPP contract rather than to be satisfied with the qualities of the tendering procedure. However, the implementing authority might likewise be satisfied with an achievement of objectives at a suboptimal level, in anticipation of receiving benefits from the sponsors by providing sponsors favour in the process of contract approval as well as the post-monitoring phase. Therefore, stakeholder satisfaction might be relatively less important to the parties concerned.

7.6.2 Relative significance of indicators

An analysis of the results relating to the indicators suggests that, for three groups of indicators, the order of significance is sensitive to the weights. The sensitivity analysis by reducing Likert scaled scores in a systematic manner confirmed this finding along with others. The first group, including indicator ‘value for money’, ‘innovation in public sector’, ‘trust and respect’, ‘project sustainability’, and ‘PPP sector development’, seem to be highly sensitive to the weights across all of the projects. This group obtained very low scores when considering weights, but high scores when using Likert scale measurement. Hence, it is understandable that extremely low weightings of these indicators explain the lower weighted scores. Moreover, there is no practice of assessing value for money in the selected projects; accordingly, stakeholders seem to be less concerned with the VFM. They also appear to be less aware of the innovation in the public service, the mutual trust and respect for the partners, the skills of the private sector and the PPP sector development in the selected projects.

The second group of indicators (‘life cycle evaluation and monitoring’, ‘optimal risk allocation’, ‘payment and government guarantees’, ‘quality of assets’, ‘feasibility analysis’, ‘integration of locals’, ‘financial cost’, and ‘responsiveness of concessionaire’) received consistently higher weighted scores in all of the projects, but relatively lower unweighted scores compared to the first group. This second group has consistent scores in both weighted and unweighted measurement approaches. Despite their lower unweighted scores, this group seems to have higher scores because they have higher weightings, derived from the perceptions of the related experts in Bangladesh.

In between these two groups, a third one emerges. This includes the remaining 19 indicators[8] (P, ID, EF, EG, NA, SO, IA, PIT, ECS, SCM, FT, C, TC, LCM, DS, PrKS,

[8] P—Profitability; ID—Infrastructure development; EF—Environmental friendliness; EG—employment generation; NA—Needs assessment; SO—SMART Objectives; IA—Implementability assessment; PIT—Public interest test; ECS—Efficient concessionaire selection; SCM—selection criteria and method; FT—Fairness and transparency; C—Cost consideration; TC—Time consideration; LCM—Life cycle maintainability; DS—Dispute settlement; PrKS—

PuCC, PRR, MO) that come from the lowest and mid-level scoring indicators, including traditionally important performance indicators such as time, cost and private sector knowledge and skill. The weightings again explain the relative significance of this group of indicators.

7.7 Concluding remarks

This chapter includes three major findings, which are outlined in the following paragraphs: 1) the difference between the unweighted and the weighted scores, 2) the improved understanding of KPAs and indicators, and 3), the inter-project highlights of the scores.

Difference between unweighted and weighted scores

The weighted scores of KPAs and indicators differ from their unweighted scores, which changes their order of significance in measuring project performances. The weighted scores of the KPAs 'transparency and accountability' and 'financing' have clearly improved, while those of the KPA 'stakeholder satisfaction', 'sustainability of partnerships', and 'socioeconomic development' have deteriorated in all of the projects, relative to the unweighted scores. Likewise, the weighted scores for a group of indicators (including LCEM, ORA, PG, Q, FA, IL, FC, and RC) became elevated while the weighted scores of another group (including VFM, IPS, TR, PrS and PSD) dropped. This is primarily because the higher weightings from that group of indicators resulted from the perceptions of the relevant PPP experts in Bangladesh.

Private sector knowledge and skill; PuCC—Public Sector Capacities and Coordination; PRR—Partners roles and responsibilities; MO—Meeting objectives;

Improved understanding of KPAs and indicators

The weighted process helps to provide an improved understanding of the relative significance of KPAs and their component indicators. Combining the weights with the scores may contribute to reducing biases of either perceived Likert scaled scores or only the weightings. This improved understanding could help project implementers and regulators by informing relatively more important area of PPP performance for efficient resource allocation.

Inter-project highlights of the scores

Finally, the findings also suggest that the overall scores of the selected projects, based on the unweighted and weighted measures, seem to have related to their performances reported in the publicly available documents and other media reports (discussed in chapter 6) (Dhaka Stock Exchange, 2010; S. Khan, 2007; World Bank, 2014a). The HPL and KPCL are two widely reported best-performing IPPs in Bangladesh, considering all aspects of PPPs, particularly in achieving cost and time performances and in providing low tariff electricity (Dhaka Stock Exchange, 2010; M. Khan et al., 2012). These experiences support the performance scores derived for them in this study.

Another two projects, including the DNPGL and DSPGL, perform relatively poorly compared to the HPL and KPCL. They were delayed in achieving their commercial operation date because of difficulties relating to land transfer and political force majeure. They also suffered from cost overrun (ICB Capital Management Ltd, 2016). The difficulties stated above in these projects are consistent with the poor performance scores for them.

The remaining two projects (B-R and H412) were implemented by public sector organisations. From the initial analysis, these projects looked better than the DNPGL and

DSPGL, but worse than the HPL and KPCL, with respect to their performance scores. However, the sensitivity analysis showed those projects as performing even worse than the DNPGL and DSPGL, which is logical and acceptable because the sensitivity test considered reduced scores for the performance objectives unreflected in the more traditional analysis. Public sector operated power projects (B-R and H412) are assumingly exposed to lesser uncertainty, but are privileged with selective tendering processes (e.g., unsolicited proposals), and thus generally have the scope to show better performance. The next chapter presents the overall conclusions and policy recommendations developed from the research.

Chapter Eight: Conclusion and policy recommendations

8.1 Introduction

This chapter presents the overall conclusion of the study. Section 8.2 provides a review of the research questions and presents associated research findings, section 8.3 provides further discussion on the significance and major contributions briefly presented in chapter one. Section 8.4 provides an overview of the limitations of the study while details thereon have been discussed in chapter four. Section 8.5 concludes by pointing to some directions for future research on the major debatable issues revealed in this study.

8.2 Review of the research questions and major findings

The aim of this study was to develop a framework of weighted KPAs and indicators and subsequently to apply it in measuring and explaining the performance of public-private partnerships in developing countries. The major outcome of this study is, therefore, a methodological innovation in developing a weighted indicator system by using the AHP method and its application to a number of power sector PPPs in Bangladesh. To achieve the research outcomes, a set of four research questions was framed, which are as follows:

RQ1. What are the most appropriate indicators and hence key performance areas (KPAs) of PPPs in developing countries?

RQ2. What are the weights of the different KPAs and indicators of PPP performance evaluation in developing countries and how do they differ from those of developed countries?

RQ3. What are the most important performance areas of the power sector PPPs in Bangladesh using a traditional approach of analysing case experiences?

RQ4. What are the actual performance scores of the sample of power sector PPPs in Bangladesh applying developed weights of KPAs and indicators and how do they differ from unweighted scores derived from industry experts and/or readily available performance assessments?

To find the answers to these research questions, a mixed-method approach was applied. Prior to applying the main methodology (analytical hierarchy process—AHP) used in this study, a list of forty-one performance indicators was initially identified by an exhaustive review of the related literature. These indicators were then grouped into eight KPAs (related to RQ1). The AHP was applied to attach weights to the KPAs and indicators as the main methodology (RQ2), based on the perceptions elicited from the PPP experts in Bangladesh by using an appropriately structured questionnaire. Subsequently, an exploratory case study method was used to examine the experiences of six power-sector PPPs (independent power producers—IPPs) in Bangladesh (RQ3). Finally, the developed weights were applied to the selected projects to derive the scores of individual project performance by interacting them with the Likert scaled scores obtained through a project-specific questionnaire survey administered in the latter stage of the study (RQ4).

Major findings

In response to the RQ2, a model/framework of weighted performance indicators has been developed for evaluating PPP performance in Bangladesh. Unlike developed countries, a different set of KPAs and indicators are found to be dominant in measuring PPP performances in the context of the developing countries such as Bangladesh. In developed countries, for instance, cost, time and quality typically seemed to be the most important indicators. However, in this study, ‘financing’ ‘planning and initiation’, and ‘transparency and accountability’ are found to be the most significant KPAs in

Bangladesh while ‘socioeconomic development’ is perceived to be the least significant KPA. Regarding indicators, ‘feasibility analysis’ is weighted as the most important one, followed by ‘life cycle evaluation and monitoring’, ‘optimal risk allocation’, and ‘responsiveness of concessionaire’.

In response to RQ3, our results reveal that the public sector commitment in Bangladesh is relatively more important than the enactment of legislation for the success of the power sector PPPs. Applying laws depends on the institutional qualities, but they are generally deficient in developing countries including Bangladesh, as indicated by existing literature (Panayides et al., 2015). The results also demonstrate that ‘improving power supply’ and ‘innovative financing’ are the most achieved performance areas in power sector PPPs based on the traditional case analysis while ‘financing’, ‘planning and initiation’ and ‘transparency and accountability’ are the most achieved KPAs based on our newly developed KPA system.

Using the KPAs, a pathway framework for evaluating the performance of the power sector PPPs is proposed, in which some differences in the performance outcomes, based on the two different evaluation approaches, are documented. These differences draw critical attention to the traditional mechanism that could usefully be replaced by a comprehensive evaluation mechanism, such as our KPA system, in the developing countries. Furthermore, cost overruns and schedule delay are some common features in most of the power sector PPPs in Bangladesh, nevertheless interest in using the PPP option in the different sectors has expanded recently. This trend inevitably calls for an in-depth empirical research to understand the real outcomes of the PPPs in terms of efficiency gains in the long run, focusing on an analysis of the cost-effectiveness of the IPPs in Bangladesh.

The result related to the RQ4 indicates that some power sector projects (HPL and KPCL) perform well relative to others, based on the involvement of international developers, financers, ownership type and commitment of the host government in project implementation. The assessment of the performance scores of individual projects reveals that the relative importance (weights) of the KPAs and indicators substantially change the order of their significance in performance evaluation. For example, the order of KPA 'transparency and accountability' and 'financing' are around somewhere in the mid-level when the unweighted scores are used, but their order of importance are in the highest level when the weighted scores are used. This means that the weighted process helps provide an improved understanding of the relative significance of KPAs and their component indicators. Further, the overall scores of the selected projects based on the unweighted and weighted measures relate to their performances reported in the publicly available documents and other media reports (discussed in chapter 6) (Dhaka Stock Exchange, 2010; S. Khan, 2007; World Bank, 2014a).

8.3 Value and significance of the study

- The study has several contributions. Attaching weights to the KPAs and indicators of PPPs, and applying those weights to derive individual project scores in a developing country context, especially in Bangladesh, represents an innovation and thus a contribution to the PPP performance literature. As a result, this study represents a unique example which could be used for future reference in other developing countries, especially in South Asia. Unlike traditional performance criteria, a prioritised set of performance indicators and KPAs for the PPPs of Bangladesh has been identified.
- The finding related to the public sector determination calls for relatively more effort that the host government should employ to build confidence in the private

sectors that potentially would engage in future PPP projects. The government, for example, could set standards to enhance institutional qualities related to implementing projects efficiently. Additionally, a framework for performance evaluation of power sector PPPs has been proposed, which can be used in evaluating power sector projects more objectively and systematically in Bangladesh and other developing countries.

- The weighted process (multiplying the weights with the Likert scaled scores) provided an improved understanding of the relative significance of KPAs and their component indicators and may contribute to reducing biases of either perceived Likert scaled scores or only the weightings in PPP performance evaluation. This research, therefore, adds value to the area of PPP performance evaluation in a setting of developing countries. In other sectors such as transport, health and accommodation in Bangladesh and other South Asian countries, the developed weighted indicator system could usefully be applied for evaluating PPP performance.

8.4 Limitations of the study

Like any other research, this study has some limitations. Some of these are related to the methodology used and others are related to the area of study. While details of these limitations are discussed in chapter four, a brief introduction to them has also been provided in this section.

Although the AHP is a useful method for developing weights of the KPAs/indicators, it has some potential limitations. The key components of the AHP include hierarchy composition, the scale used to measure the intensity of preferences, potential biases in the respondent selection, and the degree of ambiguity in the questions asked (Manning et al., 2016). All these issues were carefully addressed to minimise the potential loss of effectiveness from using this method. For example, to minimise the selection bias, a substantial number of respondents representing major sectors of PPPs in Bangladesh was selected. Nevertheless, future research could look at alternatives to the AHP approach for developing KPA weights.

Part of the mixed method used in this study is a case study approach. Use of a case approach can be argued to lack rigor and objectivity (Rowley, 2002). Findings from the selected case study might be considered inappropriate for generalisation because of the likelihood of the loss of important information that could remain uncovered in unattended projects. However, in this study, the projects were carefully selected based on some pre-defined criteria to avoid such loss from other projects. A similar selection process was followed in the related previous study in the context of Indonesia (Atmo et al., 2017).

The actual project information is considered sensitive to public disclosure because of confidentiality concerns, which might provide an undue advantage to the competitors. Specifically, the power sector PPPs seem to be relatively more sensitive in developing countries including Bangladesh. The denial of access to the actual information except commercial documents appears to be another difficulty to research in the area of PPP evaluation. Additionally, a lack of databases otherwise creates difficulties in identifying appropriate KPAs and indicators for a particular type of PPP project. Moreover, project characteristics and contextual features make indicator analysis a more tedious task.

Another limitation is related to the project-specific questionnaire survey. This survey was designed to obtain scores of project performance, in which a spokesperson for each project was asked to provide a score for their project. This person might be biased in scoring positively for his project because of his affiliation with that project. However, obtaining perceptions of the project-specific individuals was considered appropriate and the only possible way of obtaining the information, especially where objective information on performance is unavailable because of their sensitivity to the disclosure, with the exception of project annual reports. Such annual reports were fully utilised for documenting case experiences, but they needed to be supplemented by subjective assessments of key project personnel relating to a number of performance indicators not included in these annual reports.

PPP related literature is untied to a specific discipline, rather it is a blend of several areas of studies that include project management, engineering, public governance, contract management, and development economics. Furthermore, the literature related to PPP performance evaluation focusing on the developing countries is found to be inadequate. Nevertheless, a comprehensive review of PPP related literature as well as the World Bank and other agency documents helped to develop an understanding of the required literature to be studied and cited.

8.5 Policy recommendations and future research directions

A discussion on some critical policy issues together with the directions to future research is as follows:

- The developed model of weighted performance indicators based on the perceptions of the experts specialised in PPPs in Bangladesh has been applied to six power sector PPPs in Bangladesh to derive performance scores for those projects. However, the model needs to be tested to a larger number of cases in a different country or region. Future research could usefully do this and test for the sensitivity of the results to differences in weights. A wider set of respondents from more developing countries might be beneficial to allow for comparison of KPA weights and overall project scores between the Bangladesh and other national contexts.

- For practical use of the developed method in evaluating PPPs, a long questionnaire is required consisting of the many indicators, which may limit the usefulness of this method in practice due to low response rates. Moreover, project characteristics and contextual features make indicator selection a tedious task. However, some of the indicators may be highly correlated which means that most of the information in the indicators can be captured by a smaller subset of indicators. Therefore, future research could also usefully focus on shortening this long list of performance indicators and establishing an empirical relationship between the KPAs and indicators by using, for instance, structural equation modelling. Establishing such a relationship could potentially contribute to focusing on the most significant and short-listed indicators.
- The improved understanding of the relative significance of KPAs and their component indicators could help project implementers and regulators in power sector PPPs by informing them of the relatively more important performance areas, for which special attention should be paid in relation to enhanced resource allocation to those areas. This research, therefore, adds value to the area of PPP performance evaluation in a setting of developing countries. In other sectors such as transport, health and accommodation in Bangladesh and other South Asian countries, the developed weighted indicator system could usefully be applied for evaluating PPP performance.
- In this research (in chapter 5, 6 & 7), the 'transparency and accountability' KPA has been perceived by the respondents both in the general and project-specific survey to be one of the pressing areas for evaluating PPP performance in Bangladesh. In the case study in chapter six, information on the number of bidders participated in the tendering process in the DNPGL and DSPGL are publicly

unavailable, and unsolicited proposals were used for awarding the contract in the B-R and H412. The previous study documented a similar finding that a small number of bidders might be an evidence of a limited transparency in the PPP procurement process in Bangladesh (M. Khan et al., 2012). Given this, the transparency and accountability in PPPs, especially in the context of the developing countries, might be an interesting research endeavour to find any link of public and financial sector corruption to this area.

- PPP projects are often considered as a strategic governance tool by the government relative to their usefulness, which demotivates concerned authorities to the disclosure of necessary information for research and development (Hodge & Greve, 2005, 2017). In addition, the actual project information is considered sensitive to disclosure as discussed in the previous section. Given this, a regulated form of the disclosure, however, might be of interest for PPP sector development in Bangladesh and other developing countries, particularly because the PPPs, unlike traditional projects, involve multi-stakeholder interest that could be better protected and improved by utilising the lessons drawn from the review of and research on the ex-post information of the PPP projects.
- The long-term consequences of using the PPP option instead of traditional procurement seemed to be difficult to be measured conclusively by using KPA system or any other traditional approaches. This suggests an area for fruitful future research since the methodology and data needed to fully assess the wider socio-economic impact of PPP projects is relatively underdeveloped in the Bangladesh context. Similarly, the performance objective of efficiency gains in the traditional framework is also difficult to measure and assess by the approaches used in this

research. Future research can also empirically address the issue of efficiency gains promised by the PPPs.

- Specifically, the government of Bangladesh may also consider an in-depth study on the effectiveness of private power generation (especially independent power producers) relative to the public sector generation by including all projects with the actual information on their performances. This study might consider long-term consequences of the private generation, such as the issues related to the ownership transfer and long-term liabilities of the government. The study could also suggest the efficient use of natural gas, coal and imported fuels and explore the potential of the alternative source of energy such as renewable energy.

Appendix 1 (table A1 to A7): Weighted scores for case study projects

Table A1: Weighted scores of the HPL

	KPAs/Indicators	Weight	Normalised weight	Raw Score (1-7 Scale)	Weighted score
PI	**1. Planning and Initiation (Average)**			**7.00**	**0.2825**
PI-NA	Needs assessment	0.0310	0.0386	7.00	0.2703
PI-SO	SMART Objectives	0.0230	0.0286	7.00	0.2005
PI-IA	Implementability Assessment	0.0317	0.0395	7.00	0.2764
PI-FA	Feasibility Analysis	0.0499	0.0622	7.00	0.4351
PI-PIT	Public Interest Test	0.0264	0.0329	7.00	0.2301
T	**2. Procurement/Tendering (Average)**			**7.00**	**0.2386**
PR-ECS	Efficient Concessionaire Selection	0.0248	0.0310	7.00	0.2167
PR-SCM	Selection Criteria and Method	0.0297	0.0370	7.00	0.2588
PR-FT	Fairness and Transparency	0.0276	0.0344	7.00	0.2405
PR-SC	Standardised Contract	0.0255	--	--	--
CO	**3. Construction and Operation (Average)**			**6.00**	**0.1517**
OP-C	Cost Consideration	0.0161	0.0201	6.00	0.1203
OP-TC	Time Consideration	0.0153	0.0190	6.00	0.1141
OP-Q	Quality of assets	0.0320	0.0399	6.00	0.2393
OP-LCM	Life Cycle Maintainability	0.0226	0.0281	6.00	0.1689
OP-DS	Dispute Settlement	0.0155	0.0193	6.00	0.1159
SP	**4. Sustainability of Partnerships (Average)**			**6.40**	**0.1439**
SP-TR	Trust and Respect	0.0142	0.0177	7.00	0.1236
SP-RD	Relationship Dilemmas	0.0080	--	--	--
SP-PrKS	Private Sector Knowledge and Skill	0.0202	0.0252	6.00	0.1512
SP-PuCC	Public Sector Capacities in Coordination	0.0192	0.0240	6.00	0.1438
SP-PRR	Partner roles and Responsibilities	0.0173	0.0215	6.00	0.1291
SP-PrS	Project Sustainability	0.0197	0.0246	7.00	0.1719
F	**5. Financing (Average)**			**6.33**	**0.3130**
F-ORA	Optimal Risk Allocation	0.0447	0.0557	6.00	0.3342
F-FC	Financial Cost	0.0357	0.0444	7.00	0.3110
F-PG	Payments and Government Guarantees	0.0393	0.0490	6.00	0.2938
F-GL	Government Liabilities	0.0268	--	--	--
TA	**6. Transparency and Accountability (Average)**			**6.67**	**0.3529**
TA-IL	Integration of Locals	0.0388	0.0484	7.00	0.3387
TA-DPI	Disclosure of Project Information	0.0269	--	--	--
TA-LCEM	Life Cycle Evaluation and Monitoring	0.0485	0.0605	6.00	0.3627
TA-RC	Responsiveness of Concessionaire	0.0410	0.0511	7.00	0.3574
SS	**7. Stakeholder Satisfaction (Average)**			**6.00**	**0.0590**
SS-MO	Meeting Objectives	0.0076	0.0095	6.00	0.0568
SS-VFM	Value For Money	0.0085	0.0106	7.00	0.0745
SS-P	Profitability	0.0073	0.0091	5.00	0.0456
SS-ERM	Efficient Risk Management	0.0125	--	--	--
SED	**8. Socioeconomic Development (Average)**			**6.80**	**0.1613**
SED-PSD	PPP Sector Development	0.0201	0.0250	7.00	0.1751
SED-IPS	Innovation in Public Sector	0.0129	0.0161	7.00	0.1128
SED-ID	Infrastructure Development	0.0235	0.0293	7.00	0.2051
SED-EG	Employment Generation	0.0179	0.0223	6.00	0.1340
SED-EF	Environmental Friendliness	0.0206	0.0257	7.00	0.1796
	Total	**0.8026**	**1.0000**	**--**	**--**
	Average	**--**	**--**	**6.5313**	**0.2059**

Source: Author

Table A2: Weighted scores of the KPCL

CODE		Weight	Normalised weight	Raw Score (1-7 Scale)	Weighted score
PI	**1. Planning and Initiation (Average)**			**7.00**	**0.2825**
PI-NA	Needs assessment	0.0310	0.0386	7	0.2703
PI-SO	SMART Objectives	0.0230	0.0286	7	0.2005
PI-IA	Implementability Assessment	0.0317	0.0395	7	0.2764
PI-FA	Feasibility Analysis	0.0499	0.0622	7	0.4351
PI-PIT	Public Interest Test	0.0264	0.0329	7	0.2301
T	**2. Procurement/Tendering (Average)**			**6.33**	**0.2149**
PR-ECS	Efficient Concessionaire Selection	0.0248	0.0310	7	0.2167
PR-SCM	Selection Criteria and Method	0.0297	0.0370	6	0.2218
PR-FT	Fairness and Transparency	0.0276	0.0344	6	0.2061
PR-SC	Standardised Contract	0.0255	--	--	--
CO	**3. Construction and Operation (Average)**			**6.20**	**0.1555**
OP-C	Cost Consideration	0.0161	0.0201	6	0.1203
OP-TC	Time Consideration	0.0153	0.0190	7	0.1331
OP-Q	Quality of assets	0.0320	0.0399	6	0.2393
OP-LCM	Life Cycle Maintainability	0.0226	0.0281	6	0.1689
OP-DS	Dispute Settlement	0.0155	0.0193	6	0.1159
SP	**4. Sustainability of Partnerships (Average)**			**6.40**	**0.1454**
SP-TR	Trust and Respect	0.0142	0.0177	6	0.1060
SP-RD	Relationship Dilemmas	0.0080	--	--	--
SP-PrKS	Private Sector Knowledge and Skill	0.0202	0.0252	7	0.1764
SP-PuCC	Public Sector Capacities in Coordination	0.0192	0.0240	6	0.1438
SP-PRR	Partner roles and Responsibilities	0.0173	0.0215	6	0.1291
SP-PrS	Project Sustainability	0.0197	0.0246	7	0.1719
F	**5. Financing (Average)**			**6.33**	**0.3130**
F-ORA	Optimal Risk Allocation	0.0447	0.0557	6	0.3342
F-FC	Financial Cost	0.0357	0.0444	7	0.3110
F-PG	Payments and Government Guarantees	0.0393	0.0490	6	0.2938
F-GL	Government Liabilities	0.0268	--	--	--
TA	**6. Transparency and Accountability (Average)**			**6.67**	**0.3529**
TA-IL	Integration of Locals	0.0388	0.0484	7	0.3387
TA-DPI	Disclosure of Project Information	0.0269	--	--	--
TA-LCEM	Life Cycle Evaluation and Monitoring	0.0485	0.0605	6	0.3627
TA-RC	Responsiveness of Concessionaire	0.0410	0.0511	7	0.3574
SS	**7. Stakeholder Satisfaction (Average)**		0.0000	**6.67**	**0.0652**
SS-MO	Meeting Objectives	0.0076	0.0095	7	0.0662
SS-VFM	Value For Money	0.0085	0.0106	7	0.0745
SS-P	Profitability	0.0073	0.0091	6	0.0547
SS-ERM	Efficient Risk Management	0.0125	--	--	--
SED	**8. Socioeconomic Development (Average)**			**6.20**	**0.1472**
SED-PSD	PPP Sector Development	0.0201	0.0250	6	0.1501
SED-IPS	Innovation in Public Sector	0.0129	0.0161	6	0.0967
SED-ID	Infrastructure Development	0.0235	0.0293	6	0.1758
SED-EG	Employment Generation	0.0179	0.0223	6	0.1340
SED-EF	Environmental Friendliness	0.0206	0.0257	7	0.1796
	Total	**0.8026**	**1.0000**	**--**	**--**
	Average	--	--	6.4688	0.2028

Source: Author

Table A3: Weighted scores of the DNPGL

CODE		Weight	Normalised weight	Raw Score (1-7 Scale)	Weighted score
PI	**1. Planning and Initiation (Average)**			**4.80**	**0.1949**
PI-NA	Needs assessment	0.0310	0.0386	4	0.1545
PI-SO	SMART Objectives	0.0230	0.0286	4	0.1146
PI-IA	Implementability Assessment	0.0317	0.0395	5	0.1974
PI-FA	Feasibility Analysis	0.0499	0.0622	5	0.3108
PI-PIT	Public Interest Test	0.0264	0.0329	6	0.1972
T	**2. Procurement/Tendering (Average)**			**6.33**	**0.2160**
PR-ECS	Efficient Concessionaire Selection	0.0248	0.0310	6	0.1857
PR-SCM	Selection Criteria and Method	0.0297	0.0370	6	0.2218
PR-FT	Fairness and Transparency	0.0276	0.0344	7	0.2405
PR-SC	Standardised Contract	0.0255	--	--	--
CO	**3. Construction and Operation (Average)**			**5.60**	**0.1441**
OP-C	Cost Consideration	0.0161	0.0201	6	0.1203
OP-TC	Time Consideration	0.0153	0.0190	5	0.0951
OP-Q	Quality of assets	0.0320	0.0399	6	0.2393
OP-LCM	Life Cycle Maintainability	0.0226	0.0281	6	0.1689
OP-DS	Dispute Settlement	0.0155	0.0193	5	0.0966
SP	**4. Sustainability of Partnerships (Average)**			**5.40**	**0.1222**
SP-TR	Trust and Respect	0.0142	0.0177	5	0.0883
SP-RD	Relationship Dilemmas	0.0080	--	--	--
SP-PrKS	Private Sector Knowledge and Skill	0.0202	0.0252	6	0.1512
SP-PuCC	Public Sector Capacities in Coordination	0.0192	0.0240	5	0.1198
SP-PRR	Partner roles and Responsibilities	0.0173	0.0215	6	0.1291
SP-PrS	Project Sustainability	0.0197	0.0246	5	0.1228
F	**5. Financing (Average)**			**5.33**	**0.2670**
F-ORA	Optimal Risk Allocation	0.0447	0.0557	6	0.3342
F-FC	Financial Cost	0.0357	0.0444	5	0.2222
F-PG	Payments and Government Guarantees	0.0393	0.0490	5	0.2448
F-GL	Government Liabilities	0.0268	--	--	--
TA	**6. Transparency and Accountability (Average)**			**5.33**	**0.2866**
TA-IL	Integration of Locals	0.0388	0.0484	5	0.2419
TA-DPI	Disclosure of Project Information	0.0269	--	--	--
TA-LCEM	Life Cycle Evaluation and Monitoring	0.0485	0.0605	6	0.3627
TA-RC	Responsiveness of Concessionaire	0.0410	0.0511	5	0.2553
SS	**7. Stakeholder Satisfaction (Average)**		0.0000	**5.67**	**0.0554**
SS-MO	Meeting Objectives	0.0076	0.0095	6	0.0568
SS-VFM	Value For Money	0.0085	0.0106	6	0.0639
SS-PSP	Profitability	0.0073	0.0091	5	0.0456
SS-ERM	Efficient Risk Management	0.0125	--	--	--
SED	**8. Socioeconomic Development (Average)**			**5.00**	**0.1172**
SED-PSD	PPP Sector Development	0.0201	0.0250	4	0.1001
SED-IPS	Innovation in Public Sector	0.0129	0.0161	5	0.0806
SED-ID	Infrastructure Development	0.0235	0.0293	4	0.1172
SED-EG	Employment Generation	0.0179	0.0223	6	0.1340
SED-EF	Environmental Friendliness	0.0206	0.0257	6	0.1540
	Total	**0.8026**	**1.0000**	**--**	**--**
	Average	**--**	**--**	**5.3750**	**0.1677**

Source: Author

Table A4: Weighted scores of the DSPGL

CODE		Weight	Normalised weight	Raw Score (1-7 Scale)	Weighted score
PI	**1. Planning and Initiation (Average)**			**5.20**	**0.2108**
PI-NA	Needs assessment	0.0310	0.0386	6	0.2317
PI-SO	SMART Objectives	0.0230	0.0286	5	0.1432
PI-IA	Implementability Assessment	0.0317	0.0395	6	0.2369
PI-FA	Feasibility Analysis	0.0499	0.0622	5	0.3108
PI-PIT	Public Interest Test	0.0264	0.0329	4	0.1315
T	**2. Procurement/Tendering (Average)**			**5.67**	**0.1922**
PR-ECS	Efficient Concessionaire Selection	0.0248	0.0310	6	0.1857
PR-SCM	Selection Criteria and Method	0.0297	0.0370	5	0.1849
PR-FT	Fairness and Transparency	0.0276	0.0344	6	0.2061
PR-SC	Standardised Contract	0.0255	--	--	--
CO	**3. Construction and Operation (Average)**			**5.60**	**0.1399**
OP-C	Cost Consideration	0.0161	0.0201	6	0.1203
OP-TC	Time Consideration	0.0153	0.0190	5	0.0951
OP-Q	Quality of assets	0.0320	0.0399	5	0.1994
OP-LCM	Life Cycle Maintainability	0.0226	0.0281	6	0.1689
OP-DS	Dispute Settlement	0.0155	0.0193	6	0.1159
SP	**4. Sustainability of Partnerships (Average)**			**5.40**	**0.1222**
SP-TR	Trust and Respect	0.0142	0.0177	5	0.0883
SP-RD	Relationship Dilemmas	0.0080	--	--	--
SP-PrKS	Private Sector Knowledge and Skill	0.0202	0.0252	6	0.1512
SP-PuCC	Public Sector Capacities in Coordination	0.0192	0.0240	5	0.1198
SP-PRR	Partner roles and Responsibilities	0.0173	0.0215	6	0.1291
SP-PrS	Project Sustainability	0.0197	0.0246	5	0.1228
F	**5. Financing (Average)**			**5.67**	**0.2834**
F-ORA	Optimal Risk Allocation	0.0447	0.0557	6	0.3342
F-FC	Financial Cost	0.0357	0.0444	5	0.2222
F-PG	Payments and Government Guarantees	0.0393	0.0490	6	0.2938
F-GL	Government Liabilities	0.0268	--	--	--
TA	**6. Transparency and Accountability (Average)**			**4.33**	**0.2302**
TA-IL	Integration of Locals	0.0388	0.0484	4	0.1935
TA-DPI	Disclosure of Project Information	0.0269	--	--	--
TA-LCEM	Life Cycle Evaluation and Monitoring	0.0485	0.0605	4	0.2418
TA-RC	Responsiveness of Concessionaire	0.0410	0.0511	5	0.2553
SS	**7. Stakeholders Satisfaction (Average)**		0.0000	**6.00**	**0.0585**
SS-MO	Meeting Objectives	0.0076	0.0095	6	0.0568
SS-VFM	Value For Money	0.0085	0.0106	6	0.0639
SS-PSP	Profitability	0.0073	0.0091	6	0.0547
SS-ERM	Efficient Risk Management	0.0125	--	--	--
SED	**8. Socioeconomic Development (Average)**			**5.00**	**0.1189**
SED-PSD	PPP Sector Development	0.0201	0.0250	5	0.1251
SED-IPS	Innovation in Public Sector	0.0129	0.0161	4	0.0645
SED-ID	Infrastructure Development	0.0235	0.0293	4	0.1172
SED-EG	Employment Generation	0.0179	0.0223	6	0.1340
SED-EF	Environmental Friendliness	0.0206	0.0257	6	0.1540
	Total	**0.8026**	**1.0000**	**--**	**--**
	Average	--	--	**5.3438**	**0.1641**

Source: Author

Table A5: Weighted score of the B-R Powergen Ltd

CODE		Weight	Normalised weight	Raw Score (1-7 Scale)	Weighted score
PI	**1. Planning and Initiation (Average)**			**5.80**	**0.2356**
PI-NA	Needs assessment	0.0310	0.0386	6	0.2317
PI-SO	SMART Objectives	0.0230	0.0286	6	0.1719
PI-IA	Implementability Assessment	0.0317	0.0395	6	0.2370
PI-FA	Feasibility Analysis	0.0499	0.0622	6	0.3730
PI-PIT	Public Interest Test	0.0264	0.0329	5	0.1645
T	**2. Procurement/Tendering (Average)**			**5.67**	**0.1943**
PR-ECS	Efficient Concessionaire Selection	0.0248	0.0310	5	0.1545
PR-SCM	Selection Criteria and Method	0.0297	0.0370	6	0.2220
PR-FT	Fairness and Transparency	0.0276	0.0344	6	0.2063
PR-SC	Standardised Contract	0.0255	--	--	--
CO	**3. Construction and Operation (Average)**			**5.20**	**0.1305**
OP-C	Cost Consideration	0.0161	0.0201	6	0.1204
OP-TC	Time Consideration	0.0153	0.0190	5	0.0953
OP-Q	Quality of assets	0.0320	0.0399	5	0.1994
OP-LCM	Life Cycle Maintainability	0.0226	0.0281	5	0.1408
OP-DS	Dispute Settlement	0.0155	0.0193	5	0.0966
SP	**4. Sustainability of Partnerships (Average)**			**5.40**	**0.1213**
SP-TR	Trust and Respect	0.0142	0.0177	6	0.1062
SP-RD	Relationship Dilemmas	0.0080	--	--	--
SP-PrKS	Private Sector Knowledge and Skill	0.0202	0.0252	5	0.1258
SP-PuCC	Public Sector Capacities in Coordination	0.0192	0.0240	5	0.1196
SP-PRR	Partners roles and Responsibilities	0.0173	0.0215	5	0.1078
SP-PrS	Project Sustainability	0.0197	0.0246	6	0.1473
F	**5. Financing (Average)**			**5.33**	**0.2649**
F-ORA	Optimal Risk Allocation	0.0447	0.0557	5	0.2785
F-FC	Financial Cost	0.0357	0.0444	5	0.2224
F-PG	Payments and Government Guarantees	0.0393	0.0490	6	0.2938
F-GL	Government Liabilities	0.0268	--	--	--
TA	**6. Transparency and Accountability (Average)**			**5.00**	**0.2664**
TA-IL	Integration of Locals	0.0388	0.0484	5	0.2417
TA-DPI	Disclosure of Project Information	0.0269	--	--	--
TA-LCEM	Life Cycle Evaluation and Monitoring	0.0485	0.0605	5	0.3021
TA-RC	Responsiveness of Concessionaire	0.0410	0.0511	5	0.2554
SS	**7. Stakeholder Satisfaction (Average)**		0.0000	**6.00**	**0.0583**
SS-MO	Meeting Objectives	0.0076	0.0095	6	0.0568
SS-VFM	Value For Money	0.0085	0.0106	6	0.0635
SS-P	Profitability	0.0073	0.0091	6	0.0546
SS-ERM	Efficient Risk Management	0.0125	--	--	--
SED	**8. Socioeconomic Development (Average)**			**5.80**	**0.1369**
SED-PSD	PPP Sector Development	0.0201	0.0250	6	0.1503
SED-IPS	Innovation in Public Sector	0.0129	0.0161	6	0.0964
SED-ID	Infrastructure Development	0.0235	0.0293	6	0.1757
SED-EG	Employment Generation	0.0179	0.0223	6	0.1338
SED-EF	Environmental Friendliness	0.0206	0.0257	5	0.1283
	Total	**0.8026**	**1.0000**	**--**	**---**
	Average	**--**	**--**	**5.5313**	**0.1710**

Source: Author

Table A6: Weighted scores of the H412

CODE		Weight	Normalised weight	Raw Score (1-7 Scale)	Weighted score
PI	**1. Planning and Initiation (Average)**			**5.20**	**0.2134**
PI-NA	Needs assessment	0.0310	0.0386	5	0.1931
PI-SO	SMART Objectives	0.0230	0.0286	6	0.1719
PI-IA	Implementability Assessment	0.0317	0.0395	5	0.1975
PI-FA	Feasibility Analysis	0.0499	0.0622	6	0.3730
PI-PIT	Public Interest Test	0.0264	0.0329	4	0.1316
T	**2. Procurement/Tendering (Average)**			**6.00**	**0.2046**
PR-ECS	Efficient Concessionaire Selection	0.0248	0.0310	6	0.1854
PR-SCM	Selection Criteria and Method	0.0297	0.0370	6	0.2220
PR-FT	Fairness and Transparency	0.0276	0.0344	6	0.2063
PR-SC	Standardised Contract	0.0255	--	--	--
CO	**3. Construction and Operation (Average)**			**4.80**	**0.1249**
OP-C	Cost Consideration	0.0161	0.0201	5	0.1003
OP-TC	Time Consideration	0.0153	0.0190	5	0.0953
OP-Q	Quality of assets	0.0320	0.0399	6	0.2392
OP-LCM	Life Cycle Maintainability	0.0226	0.0281	4	0.1126
OP-DS	Dispute Settlement	0.0155	0.0193	4	0.0772
SP	**4. Sustainability of Partnerships (Average)**			**5.80**	**0.1304**
SP-TR	Trust and Respect	0.0142	0.0177	6	0.1062
SP-RD	Relationship Dilemmas	0.0080	--	--	--
SP-PrKS	Private Sector Knowledge and Skill	0.0202	0.0252	5	0.1258
SP-PuCC	Public Sector Capacities in Coordination	0.0192	0.0240	6	0.1435
SP-PRR	Partners roles and Responsibilities	0.0173	0.0215	6	0.1293
SP-PrS	Project Sustainability	0.0197	0.0246	6	0.1473
F	**5. Financing (Average)**			**5.33**	**0.2612**
F-ORA	Optimal Risk Allocation	0.0447	0.0557	4	0.2228
F-FC	Financial Cost	0.0357	0.0444	6	0.2669
F-PG	Payments and Government Guarantees	0.0393	0.0490	6	0.2938
F-GL	Government Liabilities	0.0268	--	--	--
TA	**6. Transparency and Accountability (Average)**			**5.00**	**0.2705**
TA-IL	Integration of Locals	0.0388	0.0484	4	0.1934
TA-DPI	Disclosure of Project Information	0.0269	--	--	--
TA-LCEM	Life Cycle Evaluation and Monitoring	0.0485	0.0605	6	0.3626
TA-RC	Responsiveness of Concessionaire	0.0410	0.0511	5	0.2554
SS	**7. Stakeholders Satisfaction (Average)**		0.0000	**6.00**	**0.0583**
SS-MO	Meeting Objectives	0.0076	0.0095	6	0.0568
SS-VFM	Value For Money	0.0085	0.0106	6	0.0635
SS-P	Profitability	0.0073	0.0091	6	0.0546
SS-ERM	Efficient Risk Management	0.0125	--	--	--
SED	**8. Socioeconomic Development (Average)**			**5.60**	**0.1326**
SED-PSD	PPP Sector Development	0.0201	0.0250	5	0.1252
SED-IPS	Innovation in Public Sector	0.0129	0.0161	6	0.0964
SED-ID	Infrastructure Development	0.0235	0.0293	6	0.1757
SED-EG	Employment Generation	0.0179	0.0223	5	0.1115
SED-EF	Environmental Friendliness	0.0206	0.0257	6	0.1540
	Total	**0.8026**	**1.0000**	**--**	**--**
	Average	**--**	**--**	***5.4375***	***0.1684***

Source: Author

Table A7: Summary of sensitivity analysis with reduced Likert scaled scores

KPAs/		HPL			KPCL			DNPGL			DSPGL			B-R			H412		
IND	Nw	As	Rs	Ws	As	Rs	Ws	As	Rs	Ws	As	Rs	Ws	As	Rs	Ws	As	Rs	Ws
(PI) Planning and Initiation	**0.0404**	**7.00**	**7.00**	**0.2825**	**7.00**	**7.00**	**0.2825**	**4.80**	**4.00**	**0.1614**	**5.20**	**5.20**	**0.2108**	**5.80**	**5.80**	**0.2355**	**5.20**	**5.20**	**0.2133**
(NA) Needs assessment	0.0386	7.00	7.00	0.2703	7.00	7.00	0.2703	4.00	4.00	0.1545	6.00	6.00	0.2317	6.00	6.00	0.2317	5.00	5.00	0.1931
(SO) SMART Objectives	0.0286	7.00	7.00	0.2005	7.00	7.00	0.2005	4.00	4.00	0.1146	5.00	5.00	0.1432	6.00	6.00	0.1718	6.00	6.00	0.1718
(IA) Implementability Assessment	0.0395	7.00	7.00	0.2764	7.00	7.00	0.2764	5.00	4.00	0.1579	6.00	6.00	0.2369	6.00	6.00	0.2369	5.00	5.00	0.1974
(FA) Feasibility Analysis	0.0622	7.00	7.00	0.4351	7.00	7.00	0.4351	5.00	4.00	0.2486	5.00	5.00	0.3108	6.00	6.00	0.3729	6.00	6.00	0.3729
(PIT) Public Interest Test	0.0329	7.00	7.00	0.2301	7.00	7.00	0.2301	6.00	4.00	0.1315	4.00	4.00	0.1315	5.00	5.00	0.1644	4.00	4.00	0.1315
(T) Tendering	**0.0341**	**7.00**	**7.00**	**0.2386**	**6.33**	**6.33**	**0.2149**	**6.33**	**6.33**	**0.2160**	**5.67**	**5.67**	**0.1922**	**5.67**	**2.00**	**0.0682**	**6.00**	**2.00**	**0.0682**
(ECS) Efficient Concessionaire Selection	0.0310	7.00	7.00	0.2167	7.00	7.00	0.2167	6.00	6.00	0.1857	6.00	6.00	0.1857	5.00	2.00	0.0619	6.00	2.00	0.0619
(SCM) Selection Criteria and Method	0.0370	7.00	7.00	0.2588	6.00	6.00	0.2218	6.00	6.00	0.2218	5.00	5.00	0.1849	6.00	2.00	0.0739	6.00	2.00	0.0739
(FT) Fairness and Transparency	0.0344	7.00	7.00	0.2405	6.00	6.00	0.2061	7.00	7.00	0.2405	6.00	6.00	0.2061	6.00	2.00	0.0687	6.00	2.00	0.0687
(CO) Construction and Operation	**0.0253**	**6.00**	**6.00**	**0.1517**	**6.20**	**6.20**	**0.1555**	**5.60**	**4.00**	**0.1011**	**5.60**	**4.00**	**0.1011**	**5.20**	**4.00**	**0.1011**	**4.80**	**4.00**	**0.1011**
(C) Cost Consideration	0.0201	6.00	6.00	0.1203	6.00	6.00	0.1203	6.00	4.00	0.0802	6.00	4.00	0.0802	6.00	*4.00*	0.0802	5.00	*4.00*	0.0802
(TC) Time Consideration	0.0190	6.00	6.00	0.1141	7.00	7.00	0.1331	5.00	4.00	0.0761	5.00	4.00	0.0761	5.00	*4.00*	0.0761	5.00	*4.00*	0.0761
(Qa) Quality of assets	0.0399	6.00	6.00	0.2393	6.00	6.00	0.2393	6.00	4.00	0.1596	5.00	4.00	0.1596	5.00	*4.00*	0.1596	6.00	*4.00*	0.1596
(LCM) Life Cycle Maintainability	0.0281	6.00	6.00	0.1689	6.00	6.00	0.1689	6.00	4.00	0.1126	6.00	4.00	0.1126	5.00	*4.00*	0.1126	4.00	*4.00*	0.1126
(DS) Dispute Settlement	0.0193	6.00	6.00	0.1159	6.00	6.00	0.1159	5.00	4.00	0.0773	6.00	4.00	0.0773	5.00	*4.00*	0.0773	4.00	*4.00*	0.0773
(SP) Sustainability of Partnerships	**0.0226**	**6.40**	**6.40**	**0.1439**	**6.40**	**6.40**	**0.1454**	**5.40**	**5.40**	**0.1222**	**5.40**	**5.40**	**0.1222**	**5.40**	**2.00**	**0.0452**	**5.80**	**2.00**	**0.0452**
(TR) Trust and Respect	0.0177	7.00	7.00	0.1236	6.00	6.00	0.1060	5.00	5.00	0.0883	5.00	5.00	0.0883	6.00	2.00	0.0353	6.00	2.00	0.0353
(PrKS) Private Sector Knowledge and Skill	0.0252	6.00	6.00	0.1512	7.00	7.00	0.1764	6.00	6.00	0.1512	6.00	6.00	0.1512	5.00	2.00	0.0504	5.00	2.00	0.0504
(PuCC) Public Sector Capacities in Coordination	0.0240	6.00	6.00	0.1438	6.00	6.00	0.1438	5.00	5.00	0.1198	5.00	5.00	0.1198	5.00	2.00	0.0479	6.00	2.00	0.0479
(PRR) Partners roles and Responsibilities	0.0215	6.00	6.00	0.1291	6.00	6.00	0.1291	6.00	6.00	0.1291	6.00	6.00	0.1291	5.00	2.00	0.0430	6.00	2.00	0.0430
(PrS) Project Sustainability	0.0246	7.00	7.00	0.1719	7.00	7.00	0.1719	5.00	5.00	0.1228	5.00	5.00	0.1228	6.00	2.00	0.0491	6.00	2.00	0.0491
(F) Financing	**0.0497**	**6.33**	**6.33**	**0.3130**	**6.33**	**6.33**	**0.3130**	**5.33**	**5.33**	**0.2670**	**5.67**	**5.33**	**0.2670**	**5.33**	**5.33**	**0.2648**	**5.33**	**5.33**	**0.2610**
(ORA) Optimal Risk Allocation	0.0557	6.00	6.00	0.3342	6.00	6.00	0.3342	6.00	6.00	0.3342	6.00	6.00	0.3342	5.00	5.00	0.2785	4.00	4.00	0.2228
(FC) Financial Cost	0.0444	7.00	7.00	0.3110	7.00	7.00	0.3110	5.00	5.00	0.2222	5.00	5.00	0.2222	5.00	5.00	0.2222	6.00	6.00	0.2666
(PG) Payments and Government Guarantees	0.0490	6.00	6.00	0.2938	6.00	6.00	0.2938	5.00	5.00	0.2448	6.00	5.00	0.2448	6.00	6.00	0.2938	6.00	6.00	0.2938
(TA) Transparency and Accountability	**0.0533**	**6.67**	**6.67**	**0.3529**	**6.67**	**6.67**	**0.3529**	**5.33**	**5.33**	**0.2866**	**4.33**	**4.33**	**0.2302**	**5.00**	**4.00**	**0.2132**	**5.00**	**4.00**	**0.2132**
(IL) Integration of Locals	0.0484	7.00	7.00	0.3387	7.00	7.00	0.3387	5.00	5.00	0.2419	4.00	4.00	0.1935	5.00	4.00	0.1935	4.00	4.00	0.1935

(LCEM) Life Cycle Evaluation and Monitoring	0.0605	6.00	6.00	0.3627	6.00	6.00	0.3627	6.00	6.00	0.3627	4.00	4.00	0.2418	5.00	4.00	0.2418	6.00	4.00	0.2418
(RC) Responsiveness of Concessionaire	0.0511	7.00	7.00	0.3574	7.00	7.00	0.3574	5.00	5.00	0.2553	5.00	5.00	0.2553	5.00	4.00	0.2042	5.00	4.00	0.2042
(SS) Stakeholder Satisfaction	**0.0097**	**6.00**	**6.00**	**0.0590**	**6.67**	**6.67**	**0.0652**	**5.67**	**4.00**	**0.0390**	**6.00**	**4.00**	**0.0390**	**6.00**	**4.00**	**0.0390**	**6.00**	**4.00**	**0.0390**
(MO) Meeting Objectives	0.0095	6.00	6.00	0.0568	7.00	7.00	0.0662	6.00	4.00	0.0379	6.00	4.00	0.0379	6.00	4.00	0.0379	6.00	4.00	0.0379
(VFM) Value For Money	0.0106	7.00	7.00	0.0745	7.00	7.00	0.0745	6.00	4.00	0.0426	6.00	4.00	0.0426	6.00	4.00	0.0426	6.00	4.00	0.0426
(P) Profitability	0.0091	5.00	5.00	0.0456	6.00	6.00	0.0547	5.00	4.00	0.0364	6.00	4.00	0.0364	6.00	4.00	0.0364	6.00	4.00	0.0364
(SED) Socioeconomic Development	**0.0237**	**6.80**	**4.00**	**0.0947**	**6.20**	**4.00**	**0.0947**	**5.00**	**4.00**	**0.0947**	**5.00**	**4.00**	**0.0947**	**5.80**	**4.00**	**0.0947**	**5.60**	**4.00**	**0.0947**
(PSD) PPP sector development	0.0250	7.00	4.00	0.1001	6.00	4.00	0.1001	4.00	4.00	0.1001	5.00	4.00	0.1001	6.00	4.00	0.1001	5.00	4.00	0.1001
(IPS) Innovation in public sector	0.0161	7.00	4.00	0.0645	6.00	4.00	0.0645	5.00	4.00	0.0645	4.00	4.00	0.0645	6.00	4.00	0.0645	6.00	4.00	0.0645
(ID) Infrastructure development	0.0293	7.00	4.00	0.1172	6.00	4.00	0.1172	4.00	4.00	0.1172	4.00	4.00	0.1172	6.00	4.00	0.1172	6.00	4.00	0.1172
(EG) Employment generation	0.0223	6.00	4.00	0.0893	6.00	4.00	0.0893	6.00	4.00	0.0893	6.00	4.00	0.0893	6.00	4.00	0.0893	5.00	4.00	0.0893
(EF) Environment friendliness	0.0257	7.00	4.00	0.1026	7.00	4.00	0.1026	6.00	4.00	0.1026	6.00	4.00	0.1026	5.00	4.00	0.1026	6.00	4.00	0.1026
Total scores		**6.53**	**6.09**	**0.1955**	**6.47**	**6.13**	**0.1946**	**5.38**	**4.69**	**0.1507**	**5.34**	**4.72**	**0.1509**	**5.53**	**3.91**	**0.1293**	**5.44**	**3.81**	**0.1255**

Notes: Nw—Normalised weights; **As**—Actual Likert scaled score; **Rs**—Reduced score; **Ws**—Weighted score. **Red coloured figures** depict reduced Likert scores.

Source: Author

Appendix 2: Invitation and survey questionnaire

Research Team:

Professor Ross Guest
Principal Supervisor

Professor Christine Smith
Associate Supervisor

Mohammad Hossain
PhD Candidate

Dear Sir/Madam,

Thank you for agreeing to participate in this important survey.

I am a doctoral student in the Department of Accounting, Finance and Economics at Griffith Business School of the Griffith University, and currently carrying out research on **Performance Evaluation of Public Private Partnerships in Developing Countries: A Case Study of Bangladesh.** This research aims to develop an ideal and inclusive index of PPP performance indicators with their relative weighting. It is expected that the research finding will contribute to the understanding and design of performance evaluation mechanisms of PPPs in developing countries.

We are collecting data for this research through a structured questionnaire. I would like you to complete the attached questionnaire, which will take around 30 to 40 minutes to answer all the questions. Alternatively, this link (https://prodsurvey.rcs.griffith.edu.au/prodls190/index.php?sid=69984&lang=en) can be followed to answer the survey questions on-line. **Please be assured that all answers you**

give will be confidential. Survey data will only be used for research purposes. Your candid response is highly valuable for this research endeavour. We would appreciate if you would hand over the completed questionnaire to me or to my representative or send it to: mohammad.hossain@griffithuni.edu.au.

Please feel free to contact to the Manager, Research Ethics of the Griffith University Human Research Ethics Committee on +61 xxxxxxxxx or at research-ethics@griffith.edu.au, if you have any concern or compliant about the research. For any general question about the research or questionnaires, please contact me on +880xxxxxxxxx or at mohammad.hossain@griffithuni.edu.au or Syed Mohammad Aminur Rahman, our independent local contact person on our behalf, on +8801xxxxxxxx. By completing this Questionnaire it is assumed that you consent to participate in this research.

We would be grateful for your valuable time and contribution to this research effort. Have a happy and prosperous life.

Yours sincerely,

Mohammad Hossain
PhD Candidate
Department of Accounting, Finance and Economics
Griffith Business School
Griffith University
Australia.

Survey Questionnaire

Section A: Background Information

A1. Which type of organisation do you work in currently?
Choose one of the following answers

- Public sector organisation
- Private sector organisation
- Research organisation/university
- Financier
- Consultancy firm
- Other:

A2. What is your current position in the organisation?
Choose one of the following answers

- Top level
- Mid- level
- Lower level
- Other:

A3. What is your primary role in the current organisation?
Choose one of the following answers

- Public sector official or agent
- Private sector employees
- Researcher
- Contractor/operator
- Consultant
- Other:

A4. How many years of experience in total do you have in a PPP or related organisation?
Choose one of the following answers

- Less than 1 year
- 1 to 2 years
- 3 to 5 years
- 6 to 10 years
- 11 to 15 years
- 16 to 20 years
- Above 20 years

A5. What type of PPP or related organisations have you worked for, including the current one?
Check any that apply

- Transportation

- ☐ **Power and energy**
- ☐ **Education**
- ☐ **Housing and accommodation**
- ☐ **Commercial zone**
- ☐ **Hospital**
- ☐ **Other:** ____

A6. What is your gender?

Choose one of the following answers

- ○ **Male**
- ○ **Female**

A7. What is your age?

Choose one of the following answers

- ○ **Under 26 years**
- ○ **26 to 35 years**
- ○ **36 to 45 years**
- ○ **46 to 55 years**
- ○ **Above 55 years**

Section B: Comparison of PPP Performance Indicators

We identified eight key performance areas (KPAs) that are important in evaluating performance of public-private partnership (PPP) projects. We would like you to make a comparison of the performance areas listed in "Column A" (in Part One) with the areas listed in "Column C" (in Part One) in evaluating performance of PPP arrangements.

*For example: If 'Planning and Initiation' in column A is **'much more important'** in measuring performance, compared to 'tendering" (Column C), then you might choose to circle 5 on the **left side** of the middle column (B) in the box, or if it is **'very much more important'** you might circle 7, as illustrated below:*

9	8	7	6	5	4	3	2	*1*	2	3	4	5	6	7	8	9

*If "tendering" (Column C) is **'very much more important'** in measuring performance compared to 'planning and initiation' (Column A), then you might choose to circle 7 on **right side** of the middle column (B) in the box, as illustrated below:*

9	8	7	6	5	4	3	2	*1*	2	3	4	5	6	7	8	9

Similarly, you are requested to compare every row item (Column A) with the respective row item (Column C) in Part One

Please Circle:

1 for ***equal importance*** in evaluating performance

3 for ***somewhat more important*** in evaluating performance;

5 for ***much more important*** in evaluating performance;

7 for ***very much more important*** in evaluating performance;

9 for ***absolutely more important*** in evaluating performance;

2, 4, 6 & 8 = When the above values are not appropriate.

Part One: Functional areas

Column A: KPAs	Column B: Scale of Importance																	Column C: KPAs
Planning and initiation[9]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Tendering
Planning and initiation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Operation
Planning and initiation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Sustainability of partnerships
Planning and initiation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Financing
Planning and initiation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Transparency and accountability
Planning and initiation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Stakeholder's satisfaction
Planning and initiation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Socio economic development
Tendering[10]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Operation
Tendering	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Sustainability of partnerships
Tendering	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Financing
Tendering	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Transparency and accountability

[9] Planning and initiation refers to a plan and initiative for undertaking a PPP project.
[10] Tendering refers to a process of an acquisition of the assets/facilities for the project.

Tendering	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Stakeholder's satisfaction
Tendering	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Socio economic development
Operation[11]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Sustainability of partnerships
Operation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Financing
Operation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Transparency and accountability
Operation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Stakeholder's satisfaction
Operation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Socio economic development
Sustainability of partnerships[12]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Financing
Sustainability of partnerships	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Transparency and accountability
Sustainability of partnerships	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Stakeholder's satisfaction
Sustainability of partnerships	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Socio economic development
Financing[13]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Transparency and accountability
Financing	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Stakeholder's satisfaction
Financing	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Socio economic development
Transparency and accountability[14]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Stakeholder's satisfaction
Transparency and accountability	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Socio economic development
Stakeholder's satisfaction[15]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Socio economic development[16]

Under the KPAs, there are forty-one indicators in total. These indicators are considered responsible for measuring the performance of Public Private Partnership (PPP) projects in developing countries. We would like you to make a comparison of the indicators listed in "Column A" with the indicators listed in "Column C".

For example: If 'Need assessment' (in column A) is ***'much more important'*** *in measuring performance, compared to 'SMART objectives' (in Column C), then you might circle 5 on the* ***left side*** *of the middle column (1) in the box, or if it is* ***'very much more important'*** *you might circle 7, as illustrated below:*

9	**8**	**7**	**6**	**5**	**4**	**3**	**2**	***1***	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**

[11] Operation refers to a commercial starting of the operation of the project and operates until the end of the contract.
[12] Sustainability of partnerships refers to a durability of partnership in terms of its effectiveness and attainment of collective project goals.
[13] Financing refers to an arrangement of investment and government guarantees for the project;
[14] Transparency and accountability refers to a degree of disclosure to the project activities and commitment to the people the project targets.
[15] Stakeholder's satisfaction refers to the satisfaction of the partners and end users.
[16] Socio economic development refers to an ultimate benefit of the project for the economy and society.

*If 'SMART objective' (Column C) is **'much more important'** in measuring performance compared to 'need assessment' (Column A), then you might circle 5 on **right side** of the middle column (B) in the box, as illustrated below:*

9	8	7	6	5	4	3	2	*1*	2	3	4	5	6	7	8	9

Similarly, you are requested to compare every row item (Column A) with the respective row item (Column C) in case of Part Two.

Please Circle:

1 for ***equal importance*** in evaluating performance

3 for ***somewhat more important*** in evaluating performance;

5 for ***much more important*** in evaluating performance;

7 for ***very much more important*** in evaluating performance;

9 for ***absolutely more important*** in evaluating performance;

2, 4, 6 & 8 = When the above values are not appropriate.

Part Two: Indicators

1. Planning and initiation

Column A: Indicators	Column B: Scale of Importance																	Column C: Indicators
Need assessment[17]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	SMART objectives
Need assessment	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Implementability assessment
Need assessment	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Feasibility analysis
Need assessment	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Public interest test
SMART objectives[18]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Implementability assessment
SMART objectives	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Feasibility analysis
SMART objectives	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Public interest test
Implementability assessment[19]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Feasibility analysis
Implementability assessment	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Public interest test

[17] Need assessment refers to an assessment of the necessity to justify the project being undertaken.
[18] SMART objectives: objectives that of the projects are clearly defined (S= Specific, M=Measurable, A= Achievable, R=Realistic, and T=Time bound).
[19] Implementability assessment**:** An assessment of the likelihood of an execution of the project in terms of resources and operational environment it requires.

Feasibility analysis[20]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Public interest test[21]

2. Procurement

Column A: Indicators	Column B: Scale of Importance																	Column C: Indicators
Efficient concessionaire selection[22]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Selection criteria and method
Efficient concessionaire selection	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Fairness and transparency
Efficient concessionaire selection	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Standardised contract
Selection criteria and method[23]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Fairness and transparency
Selection criteria and method	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Standardised contract
Fairness and transparency[24]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Standardised contract[25]

3. Operation

Column A: Indicators	Column B: Scale of Importance																	Column C: Indicators
Cost consideration[26]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Time consideration
Cost consideration	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Reliability/quality
Cost consideration	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Life cycle maintainability
Cost consideration	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Dispute settlement
Time consideration[27]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Reliability/quality
Time consideration	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Life cycle maintainability
Time consideration	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Dispute settlement
Reliability/quality[28]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Life cycle maintainability
Reliability/quality	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Dispute settlement
Life cycle maintainability[29]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Dispute settlement[30]

4. Sustainability of partnerships

Column A: Indicators	Column B: Scale of Importance																	Column C: Indicators
Trust and respect[31]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Relationship dilemmas
Trust and respect	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Private sector knowledge and skill
Trust and respect	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Public sector capacities in coordination
Trust and respect	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Partners roles and responsibilities
Trust and respect	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Project sustainability
Relationship dilemmas[32]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Private sector knowledge and skill

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[20] Feasibility Analysis: an analysis of the project whether it is commercially or socially viable.
[21] Public interest test: a systematic test of the public interest for the project.
[22] Efficient concessionaire selection: selecting an appropriate private partner that has a reputation and required expertise.
[23] Selection criteria and method: the method and criteria that are used for selecting an appropriate concessionaire.
[24] Fairness and transparency: a competitive environment where impartiality and transparency is granted in whole of the procurement process.
[25] Standardized contract with flexibility: a format of a uniform contract agreement that is centrally designed and locally implemented, with necessary flexibility.
[26] Cost consideration: the variation of the total cost required to complete a project, such on budget, below budget or beyond budget.
[27] Time performance: the variation of time required to complete a project, such as ahead of time, on-time or after time.
[28] Quality*:* an excellence of construction and maintenance of the project;
[29] Life cycle maintainability: ability to continue maintenance over the project life without any trouble, e.g., technical and financial difficulties.
[30] Dispute occurrence & settlement: the number of disputes occurred annually and the time each dispute takes to settle.
[31] Trust and respect: a level of mutual trust and respect among the different stakeholders.
[32] Relationship dilemmas: a state of relationship problems between parties, where partner's individual interest contradicts with partner's collective interest.

Relationship dilemmas	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Public sector capacities in coordination
Relationship dilemmas	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Partners roles and responsibilities
Relationship dilemmas	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Project sustainability
Private sector knowledge and skill[33]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Public sector capacities in coordination
Private sector knowledge and skill	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Partners roles and responsibilities
Private sector knowledge and skill	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Project sustainability
Public sector capacities in coordination[34]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Partners roles and responsibilities
Public sector capacities in coordination	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Project sustainability
Partners roles and responsibilities[35]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Project sustainability[36]

5. Financing

Column A: Indicators	Scale of Importance																	Column B: Indicators
Optimal allocation of risk[37]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Financial cost
Optimal allocation of risk	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Payments and government guarantees
Optimal allocation of risk	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Optimal revenue sharing
Optimal allocation of risk	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Government liabilities
Financial cost[38]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Payments and government guarantees
Financial cost	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Optimal revenue sharing
Financial cost	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Government liabilities
Payments and government guarantees[39]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Optimal revenue sharing
Payments and government guarantees	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Government liabilities
Optimal revenue sharing[40]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Government liabilities[41]

6. Transparency and accountability

Column A: Indicators	Scale of Importance																	Column B: Indicators
Integration of locals[42]	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Disclosure of project information**
Integration of locals	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Life-cycle evaluation and monitoring**
Integration of locals	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Responsiveness of concessionaire**
Disclosure of project information[43]	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Life-cycle evaluation and monitoring**
Disclosure of project information	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Responsiveness of concessionaire**
Life-cycle evaluation and monitoring[44]	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Responsiveness of concessionaire[45]**

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[33] Private sector's knowledge and expertise: private sector's ability to gain an optimal efficiency level in design, construction and operation.
[34] Public sector capacities in coordination*:* public sector's ability to coordinate different stakeholders.
[35] Partner's roles and responsibilities: the degree of understanding about partner's roles and responsibilities.
[36] Project sustainability: an ability of the project to sustain in the long run.
[37] Optimal risk allocation**:** an allocation of risk between the parties efficiently.
[38] Financial cost: cost that causes to determine the profit margin of the private operator.
[39] Payments and government guarantees*:* amount of payments and government guarantees to the concessionaire;
[40] Optimal revenue sharing: prudent sharing of revenues (between parties), which would not dissatisfy partners and create any burden for the end users.
[41] *G*overnment liabilities: liabilities that might be created due to the availability payment made and guarantees given by government.
[42] Integration of locals: a level of an involvement of the local community with the project.
[43] Disclosure of project information: the level of disclosure of project affairs, milestones and financial information, including equity returns and fiscal commitments;
[44] Life-cycle evaluation and monitoring: a perpetual internal control mechanism that can improves transparency and accountability;
[45] Responsiveness of concessionaire**:** the sensitivity of the private party to the locals in respect of complaints and other service related issues.

7. Stakeholders satisfaction

Column A: Indicators	Scale of Importance																	Column B: Indicators
Partners satisfaction[46]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	End users satisfaction[47]

7a. Partners satisfaction

Column A: Indicators	Scale of Importance																	Column B: Indicators
Meeting objectives[48]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Value for money
Meeting objectives	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Profitability
Meeting objectives	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Efficient risk management
Value for money[49]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Profitability
Value for money	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Efficient risk management
Profitability[50]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Efficient risk management[51]

7b. End users satisfaction

Column A: Indicators	Scale of Importance																	Column B: Indicators
Economy of the services[52]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Availability
Economy of the services	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality
Availability[53]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Quality[54]

8. Socio economic development

Column A: Indicators	Scale of Importance																	Column B: Indicators
PPP sector development[55]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Innovation in public sector
PPP sector development	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Infrastructure development
PPP sector development	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Employment generation
PPP sector development	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Environment friendliness
Innovation in public sector[56]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Infrastructure development
Innovation in public sector	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Employment generation
Innovation in public sector	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Environment friendliness
Infrastructure development[57]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Employment generation
Infrastructure development	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Environment friendliness
Employment generation[58]	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Environment friendliness[59]

Thank you very much for your valuable time!!

[46] Partner's satisfaction: a level of satisfaction of the partners.
[47] End users satisfaction: a level of satisfaction that the ultimate users get from a PPP project.
[48] Meeting objectives: Achieving objectives of the project, as has been set initially by public sector partner.
[49] Value for money: the monetary amount of efficiency gains because of adopting the PPP projects instead of traditional one.
[50] Profitability: earning profit by the private sector counterpart.
[51] Efficient management of risk: handling the share of risk as allocated to each of the partners.
[52] Economy of the services: charges that the end users pay for the services. Quality of the services: an ease of getting the services.
[53] Availability of the services: an excellence that substantiates the prices of the services.
[54] Quality of the services: an ease of getting the services.
[55] PPP sector development: an emergence of a new sector in the economy for constructing and financing PPP projects.
[56] Innovation in public sector: an improvement of the service delivery system of public sector organisation through innovation.
[57] Infrastructure development (without increasing public debt): developing infrastructure without increasing public debt.
[58] Employment generation: number of jobs being created by the project.
[59] Eco-friendliness: developing infrastructure without harming environment.

Appendix 3: Request letter to Secretary of Power Division, GoB

The Secretary
Power Division
Ministry of Power, Energy and Mineral Resources
Government of the People's Republic of Bangladesh
Bangladesh, Dhaka-1000

Request for supporting Mr. Hossain's field survey and data collection for his PhD program

Ethical Approval: *GU ref no: 2016/718*

Dear Sir,

I wish to confirm that Mr Mohammad Hossain is currently a full time doctoral student in the Department of Accounting, Finance and Economics at Griffith Business School, Griffith University and under the supervision of myself and Prof Christine Smith. Mr Hossain's doctoral research focuses on "Performance Evaluation of Public Private Partnerships in Developing Countries: A Case Study of Bangladesh". The research aims to develop an index of PPP performance indicators with weights derived from survey data. It is expected that the research finding will contribute to the understanding and design of performance evaluation mechanisms of PPPs in Bangladesh.

The survey data is essential in order to construct the index of PPP performance. For this purpose Mr. Hossain is proposing a survey of the employees/executives of the organisations/units that are involved in planning, designing, financing and implementing PPP projects in Bangladesh. He will mention the names of the specific organisations that he intends to visit. Therefore, I would be very grateful if you could provide necessary cooperation, and advise organisations that he intends to visit for conducting a survey. Your support would contribute critically to the success of his research work.

Your kind consideration regarding this matter is highly appreciated.

Thank you very much.

Yours sincerely,

Professor Ross Guest
Dean (Learning and Teaching) and
Principal Supervisor
Griffith Business School
Griffith University

Appendix 4: Research Information sheet for respondent

Research Team:

Professor Ross Guest
Principal Supervisor

Professor Christine Smith
Associate Supervisor

Mohammad Hossain
PhD Candidate

Research Project Information Sheet

Ethical Approval: ***GU ref no: 2016/718***

What is the title of the research?

Performance Evaluation of Public Private Partnerships (PPPs) in Developing Countries: A case study of Bangladesh

Why is this research for?

The research is a part of the doctoral program being undertaken by Mohammad Hossain, a PhD candidate in Griffith Business School at Griffith University. The purpose of the research is to develop an ideal and inclusive index of indicators with their relative weighting and apply such index of indicators in assessing the performance of the PPP projects to be selected from developing countries.

What do the participants have to do?

The participants will be requested to complete a structured questionnaire where they compare indicators in terms of their importance (1-9 scale) in assessing the performance of the PPP projects. The participants are expected to answer all the questions which will take 30 to 40 minutes.

Who are the target participants?

The target participants will be the people who have a background and interest in PPP arrangements in order to elicit their judgement on the priority of the selective performance indicators. These people include private sector practitioners, public sector officials and interested research groups working in PPP organisations in Bangladesh context. A purposive sampling technique will be used.

What are the expected contributions?

The list of indicators to be presented to the participants for making a comparison has been identified in an exhaustive literature review, so the individual participant will have an opportunity to enrich their experiences through an exposure to the performance indicators. Moreover, participants can get a summary of the research results in a plain language on an email request. Broadly, the research effort will result in the development of an index of performance indicators and an application of such indicators in assessing the performance of PPP projects in the developing world.

Is there any risk to the participants?

There are no foreseeable risks associated with participation in this research.

Is participant's identity confidential?

The identity of the participant will be completely confidential, as a de-identification process will be applied to make data anonymous. After analyzing the coded data, the findings will be published in an academic journal, conference presentations and PhD thesis, with no identification of the participants. Data will be securely stored in a password protected electronic file or locked cabinet at the Griffith University for period of five years.

Is participation voluntary?

Yes, participation in this survey is voluntary. Participants can withdraw from the survey any time if they like, with no difficulties. Participants are encouraged to answer all the questions.

What is the mode of conducting survey?

The respondents will be requested to complete the survey questionnaire in the way most convenient to them, including filling in the hard copy questionnaire, filling in on-line, and sending us the completed questionnaire through email.

What is the ethical code of conduct?

Griffith University follows the principles of ethics as stated in the National Statement on Ethical Conduct in Human Research. Participants can feel free to contact, if they have any concern, the Manager of Research Ethics of the Griffith University Human Research Ethics Committee on +61 7 3735 4375 or at research-ethics@griffith.edu.au. Ethical Approval number is *GU ref no: 2016/718.*

What is the Privacy Policy?

The personal information of the participants will not be disclosed to third parties without the participants' consent, except to meet the requirements of the government, legal or other regulatory authorities. After data collection, they will be stored in the research storage service of Griffith University. Only the researcher can be able to download the data from the University storage system and export them in a de-identification process to use in the software program such as Expert Choice, AHP software and Excel. Data will be securely stored in a password protected electronic file or locked cabinet at the Griffith University for period of five years. A de-identified copy of this data may be used for other research purposes. However, your anonymity will at all times be safeguarded. For further information on privacy policy, Griffith University's Privacy Plan may be consulted at https://www.griffith.edu.au/about-griffith/governance/plans-publications/griffith-university-privacy-plan.

Appendix 5: Questionnaire for project-specific survey

Research Team:

Professor Ross Guest
Principal Supervisor

Professor Christine Smith
Principal Supervisor

Mohammad Hossain
PhD Candidate

Dear Sir/Madam,

Thank you for agreeing to participate in this important survey.

I am a doctoral student in the Department of Accounting, Finance and Economics at Griffith Business School of the Griffith University, and currently carrying out research on **Performance Evaluation of Public Private Partnerships in Developing Countries: A Case Study of Bangladesh.** This research aims to assess actual performance of PPPs and their key determinants in Bangladesh. It is expected that the research findings will contribute to the understanding and design of performance evaluation mechanisms of PPPs in developing countries.

We are collecting data for this research through a structured/semi-structured questionnaire. I would be grateful if you would complete the attached questionnaire in the following page, which will take around 50 to 60 minutes to answer all the questions. **Please be assured that all answers you give will be confidential. Survey data will only be used for research purposes.** Your candid response is highly valuable for this research endeavour. We would appreciate if you would send it to: mohammad.hossain@griffithuni.edu.au.

Please feel free to contact to the Manager, Research Ethics of the Griffith University Human Research Ethics Committee on +61 7 3735 4375 or at research-ethics@griffith.edu.au, if you have any concern or compliant about the research. By completing this Questionnaire it is assumed that you consent to participate in this research.

We thank you for your valuable time and contribution to this research effort.

Yours sincerely,

Mohammad Hossain
PhD Candidate
Department of Accounting, Finance and Economics
Griffith Business School
Griffith University
Australia.

Project specific survey questionnaire

Name of the IPP (Independent power producer) project:

Physical address of the project:

Project capacity (in MW):

Rated capacity (MW):	Actual capacity (MW):

Part One: Key Performance Areas (KPAs) and Indicators

The following thirty seven indicators have been identified in the literature as relevant in measuring the performance of power sector PPP projects in developing countries. The indicators have been categorised broadly into eight key performance areas (KPAs) (***listed as A, B, C and so on***) based on performance area they belong to.

Based on your personal experience and actual information of your project, please give a score for the performance of your PPP (IPP) project against each of the KPAs and indicators listed below. **For each of the KPAs and indicators, please circle (or tick) one number (from 1 to 7) that best represents the level of the performance of this IPP project.**

	KPAs/Indicators	Measurement Criteria	Highly dissatisfactory	Dissatisfactory	Less than dissatisfactory	Average	Less than satisfactory	Satisfactory	Highly satisfactory
A	***Planning and initiation***								
1	Needs assessment	How prudently was the needs assessment of the project done?	1	2	3	4	5	6	7
2	SMART objectives	How SMART was the project objectives? (S=Specific, M=Measurable, A=Achievable, R=Realistic, and T=Time bound)	1	2	3	4	5	6	7
3	Implementability assessment	How carefully was the execution likelihood of the project assessed in terms of resources and operational environment it requires?	1	2	3	4	5	6	7
4	Feasibility Analysis	How rigorously was the feasibility analysis of the project done?	1	2	3	4	5	6	7
5	Public interest test (if any)	Was public interest of this project tested? If yes, how systematically was it done?	1	2	3	4	5	6	7
B	***Tendering***								
6	Efficient concessionaire selection	What do you think the level of reputation and expertise of the selected IPP sponsor?	1	2	3	4	5	6	7
7	Selection criteria and method of procurement	How practical was the criteria and method in selecting this IPP sponsor?	1	2	3	4	5	6	7
8	Fairness and transparency	How impartial and transparent was the tendering process to win the bid of this project?	1	2	3	4	5	6	7
9	Standardized contract (if any)	Has the contract signed with govt. counterpart been standardised? If yes, how effective is this? Please provide a rating.	1	2	3	4	5	6	7
C	***Construction and Operation***								
10	Cost performance	What is the level of cost performance in constructing this project?	1	2	3	4	5	6	7
11	Time/schedule performance	What is the level of time performance in constructing this project?	1	2	3	4	5	6	7
12	Quality of assets	Please rate the quality of the construction and assets.	1	2	3	4	5	6	7
13	Life cycle maintainability	How smoothly maintenance was/is being done without any trouble, e.g., technical difficulties etc.?	1	2	3	4	5	6	7
14	Dispute settlement (if any)	How efficiently and promptly are disputes settled, if any?	1	2	3	4	5	6	7
D	***Sustainability of partnerships***								
15	Trust and respect	Please rate the mutual trust and respect among the different stakeholders of the project.	1	2	3	4	5	6	7
16	Relationship conflict	How good is the relationship between you and govt. counterpart in collective interest of the project?	1	2	3	4	5	6	7

17	Private sector's knowledge and expertise	Please rate the private sector knowledge and skill in design, construction and operation of this project.	1	2	3	4	5	6	7
18	Public sector capacities in coordination	Please rate the public sector capacities in successfully coordinating different stakeholders.	1	2	3	4	5	6	7
19	Partner's roles and responsibilities	How sincerely do partners obey their roles and responsibilities?	1	2	3	4	5	6	7
20	Project sustainability	Please rate the ability of the project to sustain in the long run.	1	2	3	4	5	6	7
E	***Financing***								
21	Optimal allocation of risk	How efficiently and appropriately risk was allocated to IPP companies and govt. counterpart?	1	2	3	4	5	6	7
22	Financial cost	Please rate the financial cost of this project	1	2	3	4	5	6	7
23	Payments and government guarantees	Please rate the level of government payments and guarantees in power purchase and etc.	1	2	3	4	5	6	7
24	Government liabilities	Do you think that government liabilities can be created in the long run due to subsidies and guarantees? Please give a rating.	1	2	3	4	5	6	7
F	***Transparency and accountability***								
25	Integration of the locals	Please rate the extent of a participation of the local community with the project initiation and implementation.	1	2	3	4	5	6	7
26	Disclosure of project information	Please rate the extent of disclosure of project affairs, milestones and financial information, including equity returns and fiscal commitments?	1	2	3	4	5	6	7
27	Life-cycle evaluation and monitoring (if any)	How effective is the life-cycle evaluation and monitoring system of the project?	1	2	3	4	5	6	7
28	Responsiveness of IPP owner	Please rate the responsiveness of IPP owner to local complaints and needs?	1	2	3	4	5	6	7
G	***Stakeholder's satisfaction***								
	Partners satisfaction:								
29	Meeting objectives of the project	Please rate the achievement of project objectives comparing with initial targets.	1	2	3	4	5	6	7
30	Value for money	How much has the value for money been achieved from this IPP project in comparing similar MW power generation in the public sector?	1	2	3	4	5	6	7
31	Profitability	Please rate the profitability of this project.	1	2	3	4	5	6	7
32	Efficient management of risk	Please rate the efficiency of managing shared risk of this project.	1	2	3	4	5	6	7
H	***Socio-economic development***								
33	PPP sector development	What is the level of contribution of this IPP to PPP sector development, e.g., power sector PPPs?	1	2	3	4	5	6	7
34	Innovation in public sector	What is the level of contribution of this project to innovation in public services, e.g., electricity service?	1	2	3	4	5	6	7

35	Infrastructure development	What is the level of contribution of this project in developing power, road and other infrastructures?	1	2	3	4	5	6	7
36	Employment generation	What is the level of contribution of the project to employment generation in the economy?	1	2	3	4	5	6	7
37	Environmental friendliness	How environment friendly is this project?	1	2	3	4	5	6	7

<u>Part two: Some basic information of your project</u>

1. Tender calling date (month/year):

2. Contract approval date (month/year):

3. Project completion:

Expected completion date (month/year):	Actual completion date (month/year):

4. Project cost (in BDT):

Estimated cost:	Actual cost:

5. Commencement of commercial operation:

Planned date (month/year):	Actual date (month/year):

6. Contract term (excluding construction period):
7. Fuel type:
8. Name of contract signing public authority:
9. Name of financiers:

Local:____________________________ ____________________________________ _	Foreign:_________________________ _ ________________________________ _

10. Government guarantee/support (Please tick that applies):

PPA ☐	Fuel supply ☐	Land acquisition ☐	Others:………………..

Part three: Performance measurement system in your project

Q1. Is there any specific performance measurement tool/approach that is currently being used to measure overall performances in your project? If yes, please briefly mention how you measure performances. What are the key performance areas/indicators?

Q2. What do you consider to be the limitations of existing performance measurement system in your project?

Q3. What is your suggestion to improve the existing performance measurement system in your project?

Q4. Do you think that some areas/indicators are more important than others in measuring PPP (IPP) performances in your project? If yes, please list some areas and/indicators in order of their importance.

Q5. Any other comments/suggestions relating to performance measurement approach of power PPPs (IPPs) in Bangladesh.

Name and signature of the participant:

Date:

Seal

Thank you very much!!!!!

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