



# MEASURING THE SIZE OF PPPs

NCP Research Paper

## Abstract

Traditional measures of the size of PPPs focus on capital investment, which could lead to a hidden bias towards greenfield infrastructure projects and away from brownfield and services-only PPPs. This Paper reviews the options for measuring the size of PPPs against both theoretical and practical criteria, and finds that life-cycle costs (LCC) would be a better indicator for screening projects.

This Paper forms part of a wider research initiative on small-scale PPPs. Its findings were originally published as part of the NCP Research Paper entitled “Improving Value for Money in Small-Scale PPPs”.

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September 2019

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## List of Acronyms

AUD	Australian dollars
BRL	Brazilian Reais
CAD	Canadian dollars
capex	Capital expenditure
EPC	Engineering, Procurement, Construction
GBP, £	British pounds
GDP	Gross Domestic Product
HM Treasury	Her Majesty's Treasury
LCC	Life-Cycle Cost (total of capex & opex over the life of the project)
m	million
opex	Operating expenditure
PFI	UK Private Finance Initiative
PPI	Private Participation in Infrastructure
PPP	Public-Private Partnership
UK	United Kingdom
USD, \$	United States dollars
VFM	Value for Money

# 1. Introduction

## 1.1 Background and Purpose of the Paper

As a method of procurement, Public-Private Partnerships (PPPs) can be significantly more complex than traditional methods used by the public sector. PPPs require the private partner (Contractor) to take on more of the project’s risk and they, and their lenders, need to understand those risks as much as possible. This requires significant work in preparing and analyzing proposed PPP projects and in completing the tender process to appoint the Contractor. Furthermore, since PPP projects extend beyond the completion of construction to include the provision of services by the Contractor, there is a need for the government party to put in place contract monitoring and management systems. These additional costs are considered to be largely independent of the size of the project.

The decision on whether to select PPP procurement for a particular project is determined by whether the project generates greater Value for Money (VFM) as a PPP than traditional procurement methods. In essence, this means that the additional costs of using the PPP approach must be outweighed by the additional benefits that PPP brings, which arise from efficiency gains and other factors. For large infrastructure projects, these additional PPP-related costs amount to a very small share of the total project value (investment plus operations). However, for smaller projects these additional costs are more difficult to justify, since the PPP-specific benefits would have to be a much higher relative to total project value to outweigh the PPP-specific costs.

As a result, some countries consider smaller projects to be unsuitable for PPP procurement (see Table 1 below). In these countries, only projects (or bundles of projects) that are above a certain size can be included in their PPP programs; projects below the hurdle level are filtered out as part of the initial screening process.

Table 1 "Small" PPP hurdle rates, various countries

Country	Indicator	Hurdle	References
<b>Singapore</b>	Investment cost	USD50m	(World Bank/APMG, 2017)
<b>Australia</b>	Investment cost	AUD50m (USD35m)	(Australian Capital Territory, 2016)
<b>Canada<sup>1</sup></b>	Investment cost	CAD50m (USD37m)	(The Canadian Council for Public-Private Partnerships, 2016)
<b>UK</b>	Investment cost	GBP20m (USD26m)	(HM Treasury, 2003)
<b>Brazil</b>	Investment cost	BRL20m (USD12m)	(World Bank/APMG, 2017)
<b>Ethiopia</b>	Contract Value	USD50m	(Ministry of Finance, Federal Democratic Republic of Ethiopia, 2017)
<b>World Bank</b>	Investment cost	USD50m	(A Ahmad, 2014)

Table 1 shows a wide variation in hurdle values for small PPPs across different countries. This is unlikely to be justified on the basis of cost differences alone. The variation highlights the difficulty in identifying a fundamental measure of “size” that is both readily available and has a direct relationship to VFM.

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<sup>1</sup> British Columbia

Ideally, the decision criterion should be whether or not the project generates sufficient VFM to justify the resources that will need to be spent on it. While this is consistent with the underlying philosophy of justifying the use of PPP procurement based on the outcomes/benefits (VFM), rather than the inputs, the cost and time needed to prepare detailed VFM calculations means that it would not be practical to do this for screening every project. The purpose of the initial screening is to filter out the least suitable projects before spending too much in preparing them. Thus, as Table 1 indicates, investment cost (capex) is often used as the measure of project size.

This Research Paper argues that capex is a flawed proxy for VFM, and carries an inherent bias towards greenfield economic infrastructure projects at the expense of social infrastructure, brownfield and services-only PPPs. After evaluating a number of alternatives, Life Cycle Cost (LCC) is found to be a less biased indicator that can be used during the initial screening of potential PPP projects.

## 1.2 Methodology

This research uses a qualitative approach to investigate alternative measures of project size for screening potential PPPs. First, it develops a set of selection criteria, combining practical factors (ease and cost of estimation) and theoretical objectives (measuring the net benefit generated by the project, that is, VFM). Second, it identifies a set of possible alternative indicators. Third, it assesses each indicator against the criteria to identify the best option.

## 1.3 Structure of the Paper

The remainder of this Paper is structured as follows:

- Section 2 develops the selection criteria and identifies a set of possible alternative indicators for project size; and compares these indicators to identify the one that best meets the criteria;
- Section 3 compiles the analysis of the previous Sections to present key findings and conclusions and sets out possible further research to refine and extend the analysis.

## 2. A better Measure of “Size”

### 2.1 Why Does Size Matter?

In an ideal world, each potential PPP would be assessed on its merits using VFM as the criterion. VFM justifies using PPP procurement on the basis of the net benefit to society, emphasizing the project’s outcomes (such as its social and economic benefits, impact on the government budget and efficiency improvements) over its inputs (investment cost, operating cost, cost of capital). This concept is fundamental to the analysis of public sector projects. After all, the impact of a new road, for example, is not driven by how much may have been spent on making it look nice, but on the benefits arising from opening up new routes, reducing journey times, improved safety, reduced maintenance costs, etc.

Using capex, which measures the amount of one physical input (infrastructure) as a proxy for all outcomes (VFM), carries an inherent bias towards large greenfield economic infrastructure projects, at the expense of alternatives that may provide similar levels of benefit at lower levels of investment (brownfield infrastructure, services-only projects).

In practice, VFM is a complex combination of quantitative and qualitative information, including economic costs and benefits, fiscal impact, commercial profitability, technical feasibility and risk. In practice, using VFM as part of the initial screening would be both time-consuming and costly. The purpose of using a simple measure to filter out unsuitable projects in an initial screening stage is to eliminate them before significant resources are spent on the analysis. Requiring a full VFM assessment of every project would defeat the object.

VFM is usually estimated during the project preparation stage, after the project has been selected for PPP procurement. It is not a particularly useful tool for the initial screening of projects. In selecting a more suitable screening alternative, it is therefore important to use a measure of size that is a good proxy for VFM but which can also be estimated early in the process without incurring significant cost.

As suggested in Table 1 above, the most common indicator used for screening is the amount of capex involved. While this is a convenient figure, and clearly associated with the size of a new infrastructure project, it has major disadvantages in this context:

- It is a measure of cost (inputs) rather than benefits (outputs);
- It incorporates an implicit assumption that *more capex = more VFM*, which is not necessarily correct; for example, rehabilitation of an existing facility may require less capex than an entirely new build but the net benefits to the population are unlikely to be materially less;
- It creates an inherent bias against services PPPs and brownfield/rehabilitation projects where capex requirements are lower;
- It creates an inherent bias against social infrastructure projects, which tend to be smaller on average than economic infrastructure projects<sup>2</sup>.

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<sup>22</sup> The average size of all UKPFI projects (1995-2016) is USD104m. Within this, the average size of economic infrastructure projects was USD215m while that of social infrastructure projects was USD90m. Similarly, the average size of all projects in the World Bank’s PPI database (1994-2018), which only includes economic infrastructure, was USD232m. (HM Treasury, 2017) (World Bank, 2019)

## 2.2 Filtering Criteria for Measures of Project Size

One can identify different indicators of “size” of PPP projects that address these concerns to a greater or lesser extent. However, if such indicators are to be used to screen projects at an early stage, they must also satisfy practical considerations. The ideal indicator must be capable of determining whether a project justifies the additional cost and effort needed in the next stage of the process, which involves the preparation of a full VFM analysis to support a decision to proceed with the tender. This combination of theory and practice allows us to identify criteria that can be used to test potential candidates for a better measure of project size. These are presented in the table below.

Table 2 Filtering criteria for measures of project size

Criterion	Explanation
<b>Available early in the Project Cycle</b>	Indicator used as part of the initial screening.
<b>Ease of estimation</b>	Indicator used as part of the initial screening.
<b>No bias for/against certain types of PPP</b>	Ensure fairness, minimize Type 1 (rejecting a good project) and Type 2 (accepting a bad project) errors. Avoid favoring a particular type of project (e.g., infrastructure, government-pays, projects with few beneficiaries).
<b>Clear link to “size”</b>	Non-experts should be able to understand and accept the measure.
<b>Reasonable proxy for VFM</b>	VFM is the fundamental determinant of whether a PPP procurement is justified. Therefore, the measure of “size” should have a reasonable correlation with VFM.
<b>Measures benefits/outputs rather than costs/inputs</b>	It is the benefits that the project is designed to deliver, therefore the “size” of a project should measure the benefits it delivers rather than the costs it incurs.

## 2.3 Alternative Measures of Project Size

A number of alternative measures of “size” can be identified. These are presented and discussed in the table below.

Table 3 Possible indicators of PPP “size”

Proposed Indicator	Explanation
<b>Investment cost (capex)</b>	The traditional measure, benchmark against which to compare other indicators.
<b>Investment cost/beneficiary</b>	Scaled by number of beneficiaries.
<b>Life cycle cost (contract value)</b>	Measures of cost should include operating costs as well as capex – the Contractor will minimize LCC rather than capex or opex alone.
<b>Life cycle cost/beneficiary</b>	Scaled by number of beneficiaries.
<b>VFM</b>	Fundamental benchmark for PPP projects.
<b>VFM/beneficiary</b>	Scaled by number of beneficiaries.
<b>Number of permanent jobs created</b>	Measures economic and to some extent social benefits.
<b>Number of beneficiaries</b>	Measures breadth of the benefit.

<b>Density of beneficiaries (people/area)</b>	Measures concentration of benefits – to capture the view that small projects can make a big impact on the lives of beneficiaries.
<b>Impact on GDP</b>	Measures economic benefit.
<b>Amount of government support needed</b>	Measures fiscal burden (part of VFM).
<b>National or sub-national sponsor</b>	Measures concentration of benefits – to capture the view that local projects can make a big impact on the lives of beneficiaries.

2.4 Comparison against Criteria

Comparing these measures against how well they meet the criteria proposed above is one way to sort and rank them in terms of their usefulness as an early indicator of “size”. The assessment is necessarily qualitative<sup>3</sup>. The table below compares the potential indicators of “size” against the filtering criteria using a simple ✓ and ✗ scale. ✓✓✓ indicates the best match and ✗✗✗ the worst, with ? indicating an inconclusive outcome. Appendix 1 explains how the scores were arrived at.

Table 4 How well do the potential indicators meet the criteria?

	Early availability	Ease of estimation	Unbiased	Clear link to “size”	Proxy for VFM	Outputs not inputs
<b>Investment</b>	✓✓✓	✓✓	✗✗	✓✓	✗	✗✗✗
<b>Investment/beneficiary</b>	✓✓	✓✓	✗	✓	✗	✗
<b>Life cycle cost</b>	✓✓	✓	✓	✓✓✓	✓✓	✓
<b>Life cycle cost/beneficiary</b>	✓	✓	✗	✓	✗	✓✓
<b>VFM</b>	✗✗✗	✗✗✗	✓✓✓	✓✓✓	✓✓✓	✓✓✓
<b>VFM/beneficiary</b>	✗✗✗	✗✗✗	✗	✓	✗	✓
<b>Jobs created</b>	✓	✓	✗	✓	✓	?
<b>Beneficiaries</b>	✓✓	✓✓	✗	✓✓	✓✓	✓✓
<b>Beneficiary density</b>	✓✓	✓	✗	✗	✗	✓
<b>Impact on GDP</b>	✗✗✗	✗✗✗	✗✗	✓✓	✓✓	✓✓
<b>government support</b>	✓	✓	✗✗✗	✗✗✗	✓	✗✗✗
<b>National vs. sub-national</b>	✓✓✓	✓✓✓	✗✗✗	✓	✗✗	?

Even using a simple unweighted filtering approach, the analysis indicates some clear results and implications:

- LCC is superior to the other indicators being considered, providing the best balance between practical considerations and how well it captures VFM;

<sup>3</sup> It should also be possible to test the measures quantitatively, given sufficiently detailed data on actual projects or through Monte Carlo techniques. Such an exercise would be beyond the scope of the current paper.

- Number of beneficiaries also ranks highly, again balancing practical and theoretical considerations; however, neither of these measures can take into account the “concentration of benefits” argument used to justify local PPPs;
- As might be expected, capex provides a relatively weak measure of project size and it was ranked in the bottom 30% of the list. This is driven by the inbuilt bias towards capital intensive greenfield projects and the lack of a clear link between capex and VFM;
- VFM lies about mid-way on the list, the benefits being outweighed by the cost and effort required to estimate it, which makes it of little use as an initial screening tool.

Clearly, this analysis is by no means conclusive. However, it does highlight other indicators that could perform a better job than capex during the initial screening of projects to identify those suitable for more detailed VFM analysis.

## 2.5 Implications

The above analysis suggests that where project size is being used as part of the initial screening process, LCC is a less biased measure than the more common measure of capex (investment cost). It is more closely attuned to the underlying concept of PPP as a superior procurement method for certain projects, since it encompasses operations as well as investment. This is in line with one of the strongest arguments supporting PPP; that the long term transfer of risk to the private sector leads them to minimize LCC, compared to the traditional public sector procurement that uses an EPC contract to construct the infrastructure for the lowest price, then operates it using public sector staff.

The potential implications of using LCC rather than capex can be investigated using UK PFI data (HM Treasury, 2017), which includes both investment cost and the unitary charge (payments to the Contractor) over the life of the contract. By its nature, the unitary charge embodies the LCC, including financing costs and the equity return of the Contractor. The database covers 715 PFI projects that closed between 1994 and 2017. Before 2011 there was no limit on project size, although the UK Government had earlier expressed concerns over VFM in projects with investment costs below GBP20m. In 2011 GBP20m (USD25.4m) was adopted as the minimum size for consideration as a PPP.

The data can be sorted to identify how many projects that were actually closed would have been excluded if the more common USD50m capex hurdle had been adopted; then how that would change if the hurdle had been USD50m LCC. For completeness, the analysis was also performed for the UK hurdle of GBP20m (Table 5 below).

*Table 5 Analysis of UK PFI data*

Hurdle	Number of projects	% of all projects
<b>PPPs below GBP20m</b>		
capex	185	26%
life-cycle	31	4%
difference	154	22%
<b>PPPs below USD50m (GBP40m)</b>		
capex	363	51%
life-cycle	69	10%
difference	294	41%

The analysis suggests that if the UK had adopted a USD50m minimum project capex at the start of its PFI program, 363 projects that were actually closed<sup>4</sup> (51% of all closed projects) would have been excluded as being too small. If the USD50m hurdle had been applied to LCC rather than capex, only 69 of these projects (10% of all closed projects) would have failed to meet the hurdle.

Thus, under a USD50m capex hurdle, 294 projects with positive VFM scores would have been excluded that would not have failed a LCC hurdle set at the same level. The VFM of these projects would therefore have been lost to the economy.

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<sup>4</sup> Which means that they were justified by the subsequent detailed VFM analysis.

## 3. Conclusions

### 3.1 Key Findings

A number of governments have effectively excluded small-scale projects from their PPP programs. This is often justified by the argument that a significant element of PPP procurement costs remains fixed regardless of the size of the project. However, the measure that is most often used to determine whether or not a project is “small-scale” is investment cost (capex). Capex is not a particularly good proxy for VFM and incorporates a bias towards large, capital intensive, greenfield projects. This has a number of implications:

- Risk of favoring projects with the highest capex even if there are lower cost alternatives that could generate similar benefits;
- Risk of excluding brownfield and services PPPs that have lower capex but would be justified on a VFM basis;
- Risk of favoring economic over social infrastructure projects which tend to require lower capex, even if they might be justified on a VFM basis.

This research examined a number of alternatives to capex that might be used as proxies for VFM during the initial screening stage and found that LCC would be a superior indicator in this context. An analysis of UK PFI data over a period when there was no minimum size limit on PPPs, indicated that a USD50m capex hurdle would have excluded 51% of projects that were sufficiently justified by more detailed VFM analysis to proceed to tender, while an equivalent LCC hurdle would have excluded only 10%.

### 3.2 Further Research

This research provides a strong argument for adopting LCC rather than capex alone as part of the initial screening criteria to identify potential PPP projects. At the same time, its reliance on qualitative factors suggests that these findings could be reinforced by quantitative analysis. This could involve the following:

- Monte Carlo analysis to test the effectiveness of the proposed measures as proxies for VFM;
- Review of PPP case studies to identify examples of successful (in terms of VFM) projects that would not have been carried out if capex had been used as a screening criterion but would have passed if the criterion had been LCC.

A separate strand of analysis might investigate whether the typical hurdle rate of USD50m capex is justified as a benchmark for excluding smaller projects from the PPP program and whether a different rate should be used if the criterion is LCC.

### 3.3 Conclusions

There is a need to adopt a less flawed measure of “size” than traditional indicators based on capex, an input-driven approach that favors new infrastructure investments over less capital-intensive projects regardless of the potential benefits. Specifically, LCC may provide a less biased proxy for VFM while still being a practical option for the early screening of projects.

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## Appendix 1 Scoring of potential measures of “size”

	Early availability	Ease of estimation	Unbiased	Clear link to “size”	Proxy for VFM	Outputs not inputs
<b>Investment</b>	✓✓✓ Capex estimates usually prepared at pre-feasibility or earlier	✓✓ Experienced gov't. staff/technical advisors, comparable projects	xx Favors greenfield infrastructure over brownfield/services	✓✓ A big investment generally means more infrastructure	x Capex not a direct contributor to the VFM calculation	xxx Measures the amount of infrastructure injected into the project
<b>Investment/beneficiary</b>	✓✓ Beneficiaries not always available until appraisal	✓✓ Ratio of two fairly simple indicators	x Favors greenfield, high spend projects with few beneficiaries	✓ Scaling reduces but does not eliminate the link	x Capex not a direct contributor to the VFM calculation	x Capex is an input but beneficiaries may proxy for outputs
<b>Life cycle cost</b>	✓✓ Opex not always available until appraisal	✓ Usually requires some kind of financial model, demand estimate	✓ Includes both capex and opex but emphasizes high spend national projects over smaller local ones	✓✓✓ Incorporates the trade-off between investment and operating costs	✓✓ A large part of the commercial viability calculation	✓ Costs are inputs, though opex could proxy for amount of demand met
<b>Life cycle cost/beneficiary</b>	✓ Opex, beneficiaries not always available until appraisal	✓ Usually requires some kind of financial model, economic impact study	x Could favor inefficient projects with few beneficiaries	✓ Scaling reduces but does not eliminate the link	x A project with more beneficiaries should have higher VFM	✓✓ Includes beneficiaries (output) and opex (proxy for demand)
<b>VFM</b>	xxx Not estimated until appraisal stage	xxx Complex combination of financial, economic, fiscal & risk elements	✓✓✓ Measures the project's total net benefit to society	✓✓✓ In PPP terms VFM is the true measure of the size of a project	✓✓✓	✓✓✓ Measures the benefit to society derived from the outputs
<b>VFM/beneficiary</b>	xxx Requires an estimate of VFM	xxx Requires an estimate of VFM	x Could favor a project with few users who gain a lot over one with many users who gain a little	✓ Scaling reduces but does not eliminate the link	x Scaling values the benefit to an individual over the benefit to society as a whole	✓ Measures the benefit to an individual derived from the outputs, not society as a whole
<b>Jobs created</b>	✓ Not usually available until appraisal (financial model)	✓ Usually requires some kind of financial model, economic impact study	x Favors labor-intensive solutions (high opex) over capital intensive	✓ Larger projects can create more jobs	✓ To the extent that jobs represent a benefit to society, but only part of VFM – quite a narrow measure	? Labor is clearly an input, but in developmental terms job creation can be viewed as an output or benefit
<b>Beneficiaries</b>	✓✓ Usually straightforward to estimate, but not always available until appraisal	✓✓ Potential beneficiaries = catchment area population + any transients	x Favors projects that impact the most people even if individual benefits are small	✓✓ Often, though not always, more beneficiaries (“bigger”) means more VFM	✓✓ Often, though not always, more beneficiaries means more VFM	✓✓ Benefits are the main output, the reason why a project is undertaken
<b>Beneficiary density</b>	✓✓ Beneficiaries/catchment area straightforward but usually during appraisal	✓ Catchment area may be difficult if there are many transients	x Could favor projects with a small or narrowly defined catchment	x Scaling eliminates the link – eg building someone a house would score highly	x Scaling values the benefit to a small community over the benefit to society as a whole	✓ Benefits are the main output, but scaling reduces the usefulness
<b>Impact on GDP</b>	xxx Not usually a standard indicator for PPPs	xxx Requires at least investment multipliers, preferably an integrated economic model;	xx Favors investment (capex); also favors economic over social infrastructure	✓✓ A big investment generally has a larger impact on GDP	✓✓ Economic growth generally seen as a net benefit to society but ignores social; impacts (eg inequality)	✓✓ GDP growth is a key output of public sector investments, though impacts long term & difficult to measure

	Early availability	Ease of estimation	Unbiased	Clear link to "size"	Proxy for VFM	Outputs not inputs
		net impact may be small, hard to disentangle				
<b>government support required</b>	✓ Not usually available until appraisal (financial model)	✓ Requires financial model	*** Favors easily bankable, low risk, user-pays, economic infrastructure projects	*** Driven by other factors such as demand, bankability & policy on subsidies	✓ Fiscal impact is one of the components of VFM but this measure ignores additional revenues (eg taxes, concession fees)	*** Measures the funds injected into the project by government
<b>National vs sub-national</b>	✓✓✓ Identity of the PA/project sponsor known from the start	✓✓✓ Does not need to be calculated or estimated	*** Favors certain types of sponsor rather than certain types of project	✓ Municipalities generally have smaller projects (Section 2) but not always	** No clear link between project sponsor and VFM	? Neither an output nor an input