Organization and financing of public infrastructure projects

A path to economic growth and development of the Danish welfare model

MAIN REPORT

OFFENTLIGT-PRIVAT PARTNERSKAB
PUBLIC-PRIVATE PARTNERSHIPS

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PREFACE

In the autumn of 2012, five pension funds – ATP, PFA, PKA, SamPension and PensionDanmark – agreed to carry out a project to clarify the rationale for public authorities and institutional investors entering into projects organized as public-private partnerships (PPP) in Denmark.

The report is financed by the pension funds but exclusively expresses our opinion and evaluation of PPPs.

We chose a working method for the project with Ernst & Young acting as secretariat and the CEOs of the five pension funds constituting the steering group. Bech-Bruun, Copenhagen Economics and Professor Bent Flyvbjerg of Oxford University contributed the legal content, an analysis of the Danish economy and perspectives on British PPP experience, respectively.

Although the experience gained in Denmark with PPPs is positive, we quickly realized that two attitudes prevail as to whether the model should be used in Denmark. One group prefers PPPs to the public sector acting as developer, while the other group acknowledges the advantages of PPPs, but prefers a solution where the public sector acts as developer – typically referring to the fact that the additional finance costs relating to PPPs make them a more expensive solution.

Throughout the project we have noted that it is possible to improve the basis, the structure and the processes for public-sector investment decisions as well as the competences in this area.

In this report we summarize our analyses and hope to contribute to softening the somewhat inflexible views characterizing the current debate about PPPs in Denmark.

The full report is written in English while a separate summary with recommendations is available in both Danish and English.

Copenhagen, 15 May 2013

Anders Eldrup **Peter Schütze**

1 INTRODUCTION AND SUMMARY

1.1 INTRODUCTION

In the past couple of decades, the public-private partnership model (PPP) has been used by governments around the world as a means to facilitate investments in public infrastructure. Inspired by Ian Hawkesworth from the Organisation for Economic Co-operation and Development (OECD), PPP is defined as follows:[1]

A PPP is a way of delivering and funding public infrastructure projects where project risks are shared between the public and private sector.

In a PPP there is a long-term agreement between the government and a private partner where the service delivery objectives of the government are aligned with the profit objectives of the private partner. The effectiveness of the alignment depends on a sufficient and appropriate transfer of risk to the private partner. Furthermore, the government specifies the quality and quantity of the service it requires from the private partner. The private partner may be tasked with the design, construction, financing, operation and management of the infrastructure asset and the delivery of a service to the government or to the public using that asset. A key element is the bundling of the construction and operation of the asset. The private partner will receive either a stream of payments from the government, user charges levied directly on the end users, or a combination of both.

Public infrastructure can be broken down into three main categories:

- Transport infrastructure, for example tunnels, bridges, ports, roads, rail systems and grid infrastructure.
- Utilities, for example power generation, waste management, district heating, water, and telecommunications.
- Social and service infrastructure, which can be further divided into standard assets, for example administrative buildings and custom-built assets, for example schools, universities, hospitals and major cultural institutions.

PPP projects can be categorized as either greenfield (when construction is included in the contract) or brownfield (when an asset already exists).

In the present report we consider the use of the PPP model for greenfield projects.

1.2 SUMMARY AND STRUCTURE OF THE REPORT

This report covers five topics. Each topic is covered by one or more chapters. A summary of each topic is provided below.

Infrastructure investments in current economic climate – chapter 2

The current Danish macroeconomic conditions offer good opportunities for further investments in infrastructure. From a financing perspective, interest rates are low, inflation is low and stable, and resources are available in the economy to deliver infrastructure projects.

However, national and European budget rules impose effective constraints on further public spending, in particular for smaller municipalities.

The use of public funding for infrastructure assets introduces a tax distortion. This tax distortion can be remedied by funding infrastructure projects by user charges. Moreover, user charges may also be employed if viable infrastructure projects are held back due to public spending constraints.

Description of the PPP model – chapters 3 through 8

Whether a project organized in a PPP model offers maximum value for money depends on the project characteristics and is thus subject to the evaluation of the individual project.

The main advantage of the PPP model is the strong focus on driving down the total capitalized life cycle cost including capitalized risk. This is achieved by the use of output-based specifications, a single contract between the public procurer and the consortium and life cycle economics as one of the bidding criteria.

These advantages come at a cost, though, as the PPP model leads to higher cost of finance compared to public funding and potential costly changes subsequent to contract signature. If the same risk profile is assumed for the public and private investor, the only difference in the cost of finance will be the illiquidity premium, assuming that the private investor otherwise invests the capital in government debt.

Worldwide experience with the use of the model – chapter 9

The use of the PPP model was initially concentrated in the Anglo-Saxon countries with the UK leading the way. However, other countries have followed suit and the use of the PPP model is now widespread.

The rationale for using the PPP model has differed from country to country. For some countries it has been a way to finance infrastructure projects in cases where the public did not have sufficient funds itself. For other countries, the rationale has been to obtain greater certainty of the projects' life cycle cost and/or maximize value for money.

It is generally acknowledged that the PPP model significantly increases the timeliness and the ability to remain within the budget in the construction of an infrastructure asset. However, the extent to which value for money is maximized is still under scrutiny. Current research and practice developed in the UK focus on where, when and how the PPP model should be employed in order to maximize value for money.

In Denmark, the experience with PPP projects is limited and so far quite positive.

Available pension funds – chapter 10

Investment in infrastructure, characterized by predictable, stable long-term cash flows, matches the pension funds' needs well.

The Danish pension system is still accumulating funds as the reforms of the late 1980s and early 1990s take full effect. In consequence, Danish pension funds are investing significant amounts in assets in Denmark and abroad – Danish infrastructure could be included in those assets.

Potential Danish PPP infrastructure projects – chapters 11 and 12

Extensive energy efficiency renovation projects are typically combined with other building renovations and/or modernization to obtain efficiencies of scale. The municipalities can fund the energy efficiency renovation via borrowing. The remaining building renovation cost cannot be funded through borrowing unless deposits are made. Thus many attractive energy efficiency projects are foregone.

A local government infrastructure facility that waives the requirement to deposit funds can overcome this barrier. In this context, the PPP model is advantageous because the PPP model can be structured to keep net cash flows positive or at least neutral for the local government.

A number of Danish infrastructure projects are currently under consideration for being organized as PPPs. A brief summary of each infrastructure project is provided and the potential benefits and issues of using the PPP model in each case are discussed.

Courthouse
in Kolding

2 INFRASTRUCTURE INVESTMENTS IN CURRENT ECONOMIC CLIMATE

By Copenhagen Economics

2.1 SUMMARY

The current Danish macroeconomic conditions offer good opportunities for further investments in infrastructure. From a financing perspective, interest rates are low, inflation is low and stable and resources are available in the economy to deliver infrastructure projects.

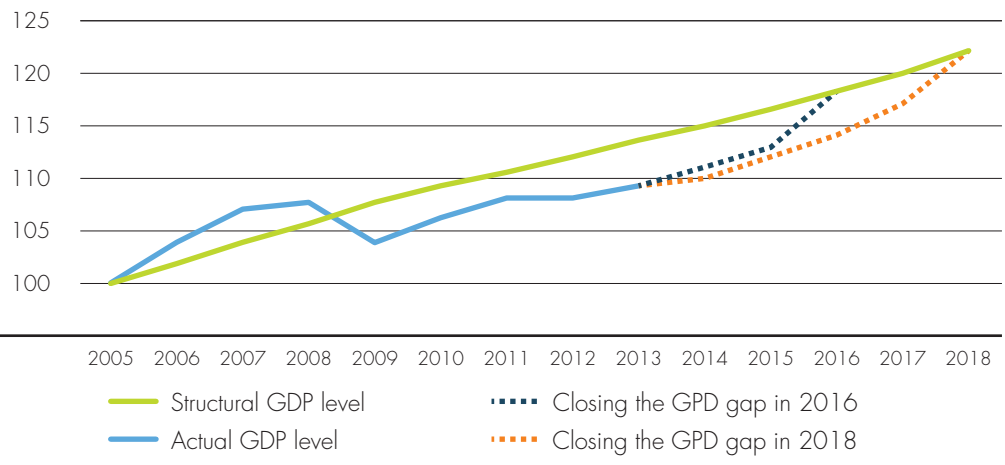
However, national and European budget rules impose effective constraints on further public spending, in particular for smaller municipalities.

2.2 ROOM FOR PUBLIC INFRASTRUCTURE INVESTMENT IN CURRENT ECONOMIC CLIMATE

The economic crisis has led to a significant reduction in the gross domestic product (GDP) compared with the so-called structural GDP, which is a measure of GDP in the absence of an economic recession or boom. The gap between actual GDP and structural GDP is known as the output gap.

When the output gap is negative, resources are available in the economy. As a result of the economic crisis, the output gap for Denmark has been and is still expected to be negative for several years to come. This is illustrated in Figure 1. In the figure, different paths to closing the output gaps from official national projections are penned in. In Denmark's Convergence Programme for 2012, the Ministry for Economic Affairs expects the output gap to be closed around 2018, provided that no economic intervention is taken. This implies that until then the economy will have free capacity.

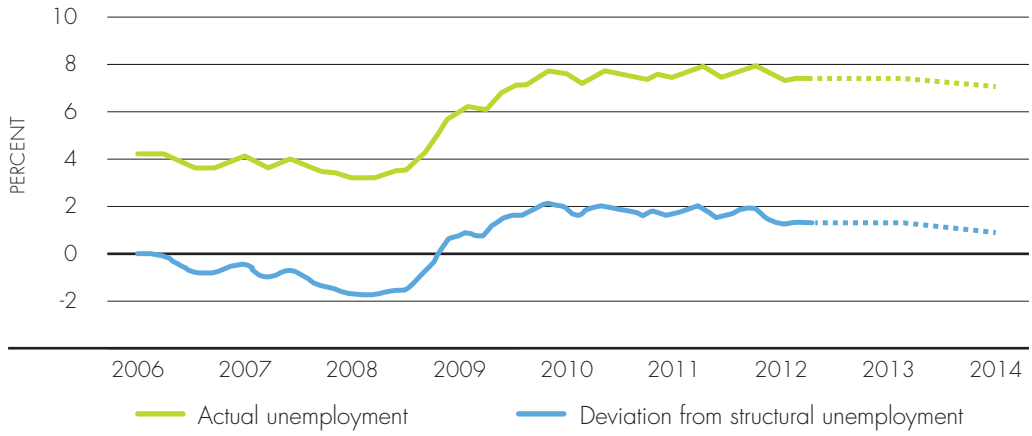
Figure 1: **Output gap in the Danish economy**



Note: The dotted lines are projections
Source: Copenhagen Economics, based on Denmark's Convergence Programme 2012

The free capacity has led to unemployment rates well above the structural level. Projections for the period up to 2014 suggest that the unemployment rate will stay at current levels.

Figure 2: **Actual unemployment and deviation from structural unemployment**

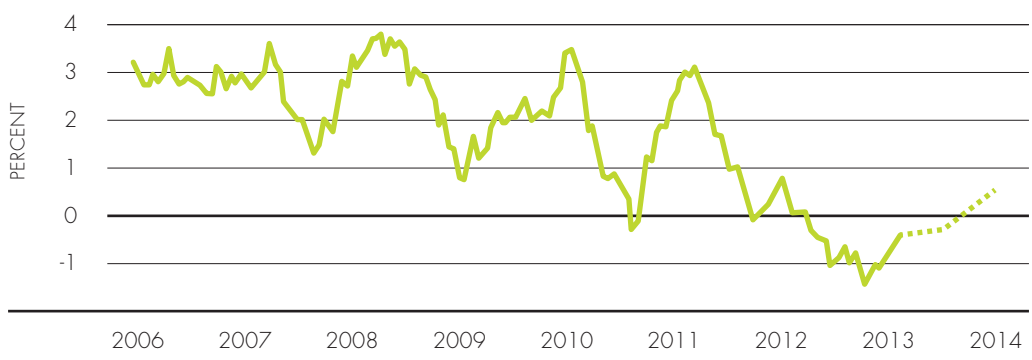


Note: The dotted lines are projections
Source: Copenhagen Economics, based on Statistics Denmark and Denmark's Convergence Programme 2012

Meeting inflation targets if GDP growth is boosted further should be feasible because unemployment is lagging in its adjustment to GDP growth. This leaves a margin to increase investment activity before targets for inflation or improved competitiveness are compromised. Thus, at present there is significant room for infrastructure investments.

With low investment levels, particularly in the residential sector and services industries, investors put their funds in money markets and fixed income bonds, thereby driving down interest rates. Inflation has dropped slightly and consequently real interest rates have decreased. From early 2011, real interest rates have even been negative, see Figure 3. In 2013 and 2014, real interest rates are projected to increase slightly. The projected level, around 0.5%, is still very low by historical standards, reflecting weak economic activity and low demand for capital. Looking ahead, the Danish fixed exchange-rate regime combined with the ongoing European sovereign debt crisis implies that real interest rates will stay low due to low nominal interest rates.

Figure 3: **Real interest rates on government bonds**

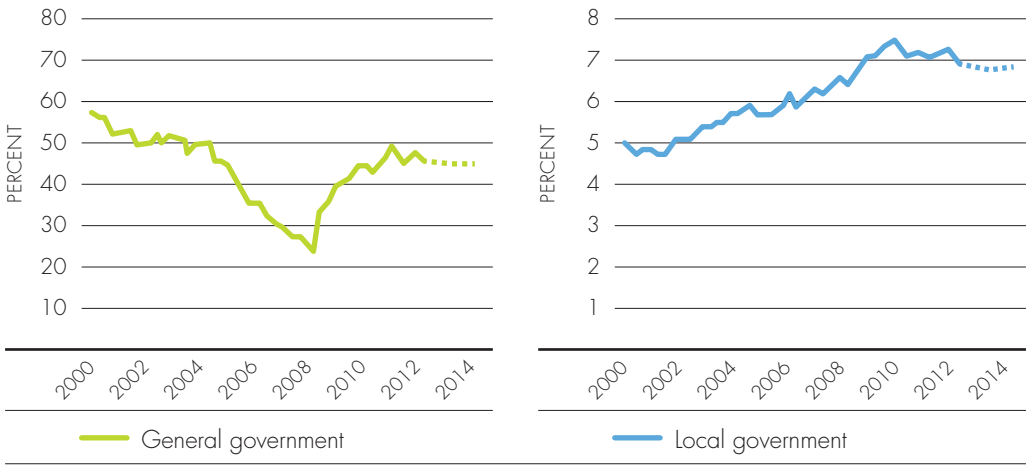


Note: We use the nominal interest rate on a 10-year government bond. We use the HICP index to adjust for inflation.
The dotted lines are projections
Source: Copenhagen Economics, based on data from Eurostat

2.3 INVESTMENT CONSTRAINTS FOR GOVERNMENT

Given that the Danish government needs to improve actual as well as structural public finances over the coming years, there is a risk that otherwise productive investments in public infrastructure may be scaled down to meet budget targets. On a formal level, the main barrier limiting increased, or just maintaining, public spending stems from the debt level and the convergence programs EURO and ERM II that member states are subject to. For Denmark, the general government debt relative to GDP has risen during the crisis. In the years ahead, including 2014, a normalization of public debt relative to GDP is projected – also entailing that local government debt ratios must adjust themselves. In Figure 4, the development of public debt relative to GDP is included.

Figure 4: **Public debt relative to GDP**

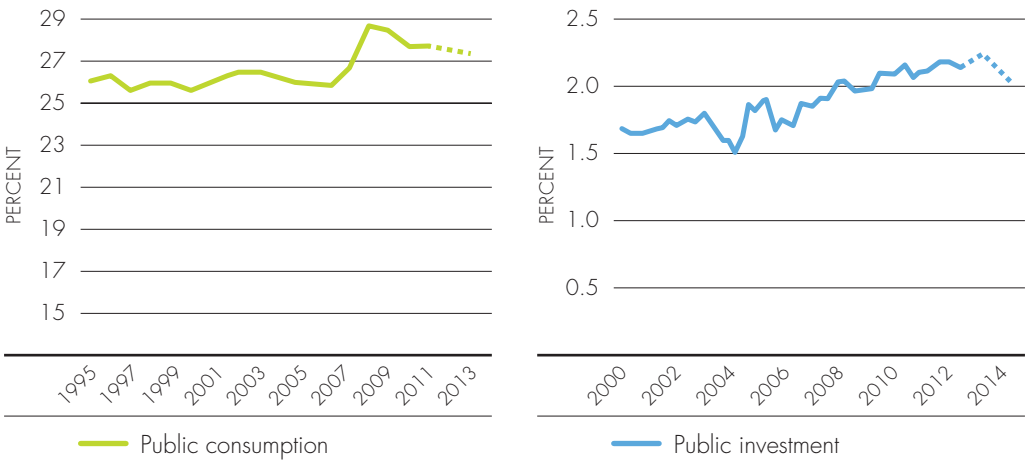


Note: The dotted lines are projections

Source: Eurostat and Copenhagen Economics

The effects of retrenchment policies are evident in public finance indicators, albeit less than in EU countries with more severe economic problems. In order to obtain lower debt levels, public consumption and thereby public investment must be reduced to support the consolidation process. In the early crisis years, public consumption in Denmark was increased substantially to cushion the abrupt decrease in private consumption. However, projections until 2014 predict that both public consumption and public investment will be marginally reduced relative to GDP.

Figure 5: **Public consumption and investment expenditure relative to GDP**

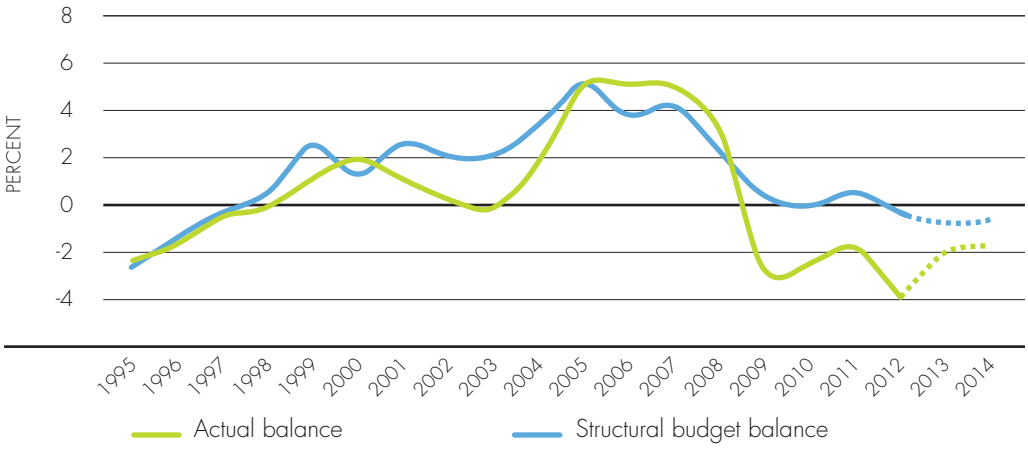


Note: The dotted lines are projections

Source: Eurostat and Copenhagen Economics

The need for consolidation going forward can be confirmed by looking at two public balance concepts. The actual balance covers the de facto balance between public outlays and tax revenue. The structural budget is the actual balance controlled for cyclical components such as unemployment.[2] Controlling for these factors, the structural budget balance provides an indication of whether there is a need to reduce structural deficits to reach a balance once the economy is back to normal capacity utilization levels. Essentially the two indicators point in the same direction: There is a need for further retrenchment which may limit investment in infrastructure if financed upfront over the budget.

Figure 6: **Actual and structural general government balances relative to GDP**



Note: The dotted lines are projections

Source: Reports on public finances in EMU and Copenhagen Economics

2.4 INVESTMENT CONSTRAINTS FOR LOCAL GOVERNMENT

Roughly 70%[3] of all Danish government spending is consumed at local government level. Thus, the framework determining local governments' incentives to carry out long-term investments is crucial for the level and quality of government investments in Denmark.

The framework may be failing in providing such sound incentives.

First, local governments in Denmark are driven by a "pay-as-you-go" finance system. Each year's expenditure must be financed out of current revenue. As many municipalities remain small, this would tend to restrain large investment projects which provide long-term benefits but which cannot be financed out of current revenue.

Second, the allowed maneuvering space for municipalities to finance investments by debt is essentially restricted to financing of utility investments. As regards loans for other investment projects, the municipality is obliged to deposit funds equal to the full projected investment costs upfront, as regulated in "Lånebekendtgørelsen" (Danish executive order on loans).[4]

In Table 1, the Danish municipalities have been grouped into three categories depending on population size (indicator of smoothing capacity), net immigration (stable incoming tax base), density (proxy for costs of providing services), youthfulness (proxy for future tax base) and average salary (measurement of tax base). It follows from Table 1 that the average capital expenditure allocated to urban development and schools depends positively on the five factors capturing the quality of the tax base and the structural operational cost.

Furthermore, it follows from Table 1 that there is a significant difference in the municipalities' ability to invest in public infrastructure. In Group 3, with an average population of 97,047, the investment level is DKK 2,193 per resident, which is more than double the DKK 803 spent in Group 1 with an average population of 37,941.

Table 1: **Demographic challenges**

	Avg. capital expenditure allocated to urban development and schools per resident, DKK	Number of residents	Net emigration per 1,000 residents	Number of residents per square kilometer	Residents younger than 30 yr. as % of residents older than 60 yr.	Avg. salary, DKK '000
Group 1 - 20 municipalities	803	37,941	-5	2,790	128	141
Group 2 – 58 municipalities	1,375	51,121	-1	5,198	193	148
Group 3 - 20 municipalities	2,193	97,047	3	8,903	233	157

Note: Capital expenditure per capita is the average investment in urban development and schools over a period of seven years (2007-2013). A time average is used rather than a single year to control for variations on a year-to-year basis

Source: Statistics Denmark and Copenhagen Economics

2.5 FINANCING PUBLIC INFRASTRUCTURE BY USER CHARGES

Whenever the government provides the financing for an economic activity, a tax distortion arises. Tax rates will have to go up – or an opportunity to reduce taxes is lost – which induces the work force to work less. The size of the effect depends on how the government finances the expenditure: a reduction of the general allowance in the income tax system reduces the available income for all by an equal amount for nearly all (recipients of transfer income as well employed persons), but for the same person has next to no effect on the incentive to work. By contrast, a higher marginal tax rate will have a significant impact on the incentive to work. The consequence is that the rate of return to society of publicly financed infrastructure needs to cover the distortion arising from public financing.

This tax distortion is also embedded in the Danish system for evaluating infrastructure investments. The inclusion is contested in the academic literature, see Text box 1, but included in the current official guidelines: whenever a public construction project is initiated, its cost and revenue stream are discounted by a social calculation rate. If this yields a negative net present value, the project will be in need of tax financing. To include this additional cost, the investment amount, which needs to be financed via taxes, is multiplied by a factor of 20%, which conservatively reflects the marginal social costs related to tax.[5]

TEXT BOX 1:

Pros and cons of including costs of public finance in cost-benefit analysis

The use of a factor to capture tax distortion arising from the need to finance public expenditure – in particular public investment – is contested.

The basic argument against using such a factor can, with considerable simplicity, be summarized in three points[6]:

- Governments decide on a given level of redistribution associated with public spending and tax, which reflects political preferences
- Then any given public expenditure increase will be financed so as to keep the total level of redistribution constant
  a. If the benefits are of a lump sum nature, all citizens get the same absolute value for the public expenditure, e.g. a new public television channel. If this is the case, financing is exactly a (higher) lump sum tax
  b. Benefits are proportional to income. This could e.g. be road infrastructure, which has most value for high-income groups. Hence, financing is done with an increase in VAT or proportional income tax
- If there is no change in the net distribution of consumption – private plus public – then no tax distortion results from the increase in public expenditure and its financing

The basic argument for using such a factor can, again with considerable simplicity, be summarized in three points[7]:

- The fact that the financing of a given investment can keep the distribution of consumption unequal does not necessarily remove the tax distortion from higher tax rates
- In certain cases of public expenditure, there may be a positive effect between income level and the intensity of the use of a particular tax-financed public good: but the very point is that a tax-financed public good is available at no marginal costs to all citizens and unlinked to work effort
- Thus the availability of the good is independent on how much individuals work at the margin and, consequently, has no positive effect on labor supply. By contrast, the higher marginal tax rate will reduce the work effort. Thus, the costs of reduced labor supply to society should at large be included in the overall calculation of net benefits

Source: See for example Kaplow (1998) and Usher (2004)

Using user charges to finance public infrastructure is relevant in at least the following cases.

First, if the cost of implementing the user charge system is lower than the cost of tax distortions. This requires an examination of two additional cost elements induced by a user charge system:

a. The direct cost of putting in place the equipment to recuperate the user charges
b. The cost induced by behavioral changes following from the user charge system (for example reduced use of the bridge reducing its social value or possible congestion near user charge collection points)

Second, if the overall public funds allocated to infrastructure projects are well below the level required to finance projects with returns exceeding benchmarks used when evaluating public infrastructure. Strictly speaking, this argument is not linked to a tax distortion but reflects the basic fact that the level of public investment at any point in time is far from an academic exercise where all projects with returns exceeding benchmark levels are carried out. The allocated funds for infrastructure projects represent a constraint, which might imply very high hurdle rates for infrastructure investment.

Nordstjerneskolen (school in Frederikshavn)

3 INTRODUCTION TO THE PPP MODEL

3.1 SUMMARY

Whether a project organized in a PPP model offers maximum value for money depends on the project characteristics and is thus subject to evaluation at the individual project level.

The main advantage of the PPP model is the strong focus on driving down the total capitalized life cycle cost including capitalized risk. This is achieved by the use of output-based specifications, a single contract between the public procurer and the consortium and life cycle economics as one of the bidding criteria.

These advantages come at a cost, though, as the PPP model leads to higher cost of finance compared to public funding and potential costly changes subsequent to contract signature.

3.2 MAIN SERVICES, CASH FLOWS AND CAPITAL STRUCTURE IN THE PPP MODEL

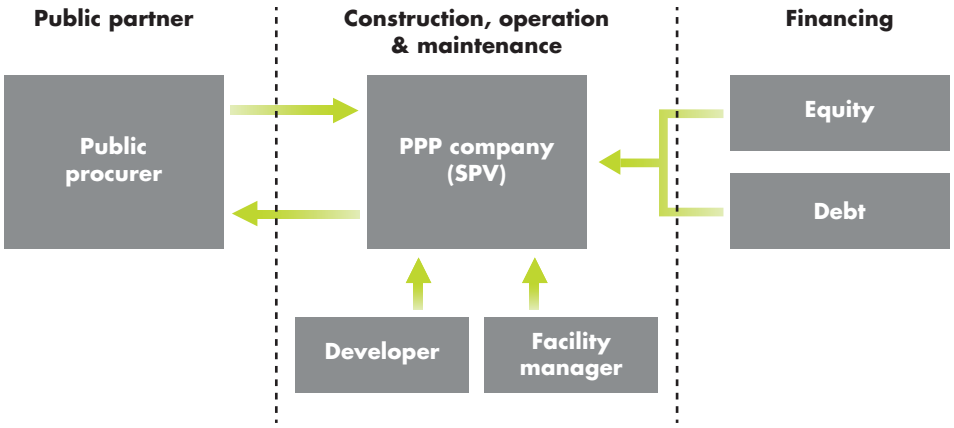
In the PPP model, a consortium (also known as private partner), typically consisting of a developer, a facility manager and a financier, forms a special purpose vehicle (SPV) that will deal with the specific infrastructure project and only that project. The SPV will be capitalized by each of the participants in the consortium. The exact distribution of debt and equity across the three participants in the consortium is based on negotiations. The developer and the facility manager will often provide significant parts of the equity while the financier will provide most or all of the debt and possibly some equity.

The balance between equity and debt depends on the risk assumed by the SPV. This risk is driven by the nature of the infrastructure project and the amount of risk that is transferred from the public procurer to the SPV. The equity injected into the SPV is effectively what the facility manager and the developer may lose if the investment does not perform as expected, i.e., in the case of budget overruns and/or lower-than-anticipated revenue. See Figure 7.

The public procurer enters into a single contract (i.e. the PPP contract) with the SPV.

The process by which the SPV is capitalized ensures that sufficient capital is injected to meet the capital needs of the project. A central part of this process is the private financier's due diligence of the project. The private financier will undertake thorough risk and business case review before deciding whether to offer debt and at what rate.

Figure 7: **Main services, cash flows and capital structure in the PPP model**



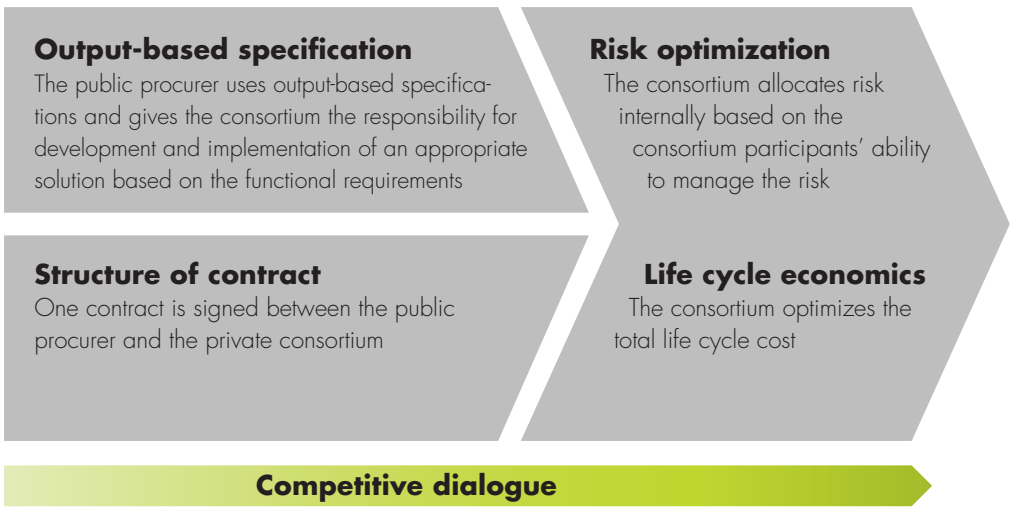
3.3 VALUE FOR MONEY IN THE PPP MODEL

The overall objective of the public procurer is to create the highest possible value for money. Value for money is a generic concept and depends, regardless of the organizational model, on several factors of both a qualitative and a quantitative nature. These factors include the life cycle cost, the construction time, the operational performance, the cost of finance, the risk level assumed by the public procurer, and the architectural design.

The main advantage of the PPP model is that it strongly focuses on driving down the total life cycle cost through project risk management. This is achieved by the use of output-based specifications, a single contract between the public procurer and the consortium and life cycle economics as one of the bidding criteria.

Through a competitive dialogue, the public and private partners establish where the components of the total project risk should be placed – either with the private partner or the public procurer. The risk transferred to the private partner is distributed internally in the consortium, so that each consortium participant accepts the risks that the participant is best able to carry.

Figure 8: **The PPP model**



Identifying the factors contributing the most to increase value for money is a key focus area in research related to the use of the PPP model. In one research study, a number of both public and private stakeholders in the UK, Hong Kong and Australia were asked to rank the factors that had (positively) contributed the most to increase value for money in the PPP projects they had undertaken on a scale from 1 to 5, where 5 was the most significant factor.[8] The rankings differ across the three countries, as illustrated in Figure 9, but certain insights are nonetheless evident.

The study identified the risk allocation, i.e. transferring the risk to the partner best able to control it, the output-based specifications and the life cycle approach, the latter being composed of the long-term nature of the contract and low project life cycle cost, to be important drivers for creating value for money. See Figure 9.

Figure 9: **Identified value for money drivers in actual PPP projects**

	Hong Kong			Australia			UK			Weighted
	N	Mean	Rank	N	Mean	Rank	N	Mean	Rank	rank
Efficient risk allocation (allocating the risk to the party best able to manage it)	33	4.18	1	11	4.55	2	61	4.02	1	1
Output-based specification	34	3.91	2	11	4.27	5	61	3.91	2	2
Long-term nature of contracts	34	3.65	7	11	4.18	7	61	3.78	3	3
Competitive tender	34	3.91	3	11	4.27	6	61	3.50	6	4
Private management skill	34	3.82	4	11	4.27	4	61	3.41	7	5
Optimal use of asset/facility and project efficiency	34	3.68	6	10	4.70	1	61	3.31	8	6
Early project service delivery	34	3.35	11	11	4.00	10	61	3.72	4	7
Private sector technical innovation	33	3.82	5	10	4.50	3	61	3.28	9	8
Risk transfer (transferring a substantial amount of risk from the public to the private partner)	34	3.59	8	11	2.73	17	61	3.57	5	9
Nature of financial innovation	34	3.56	9	11	3.73	12	61	3.25	10	10
Low project life cycle cost	34	3.47	10	11	4.00	9	61	3.24	11	11
Improved and additional facilities to the public sector	34	3.35	12	11	4.00	11	61	3.16	13	12
"Off the public sector balance sheet" treatment	34	3.15	14	11	2.36	18	61	3.23	12	13
Profitability to the private sector	34	3.18	13	10	3.00	15	61	2.84	14	14
Level of tangible and intangible benefits to the users	34	3.00	16	11	4.00	8	61	2.83	15	15
Reduction in disputes, claims and litigation	34	3.09	15	11	3.18	14	61	2.81	16	16
Low shadow tariffs/tolls	34	2.82	18	10	3.30	13	61	2.49	17	17
Environmental considerations	34	2.97	17	11	2.73	16	61	2.38	18	18

These advantages come at a cost, though, as the model leads to higher cost of finance compared to public funding and potential costly changes subsequent to contract signature.

The connection between value for money and the allocation of capital is described in Text box 2.

A summary and the full text of Professor Flyvbjerg's observations about value for money in PPP projects are provided in Text box 3 and Appendix E, respectively. The legal aspects of the competitive dialogue and the termination and exit of the PPP contract are provided in Text box 2 and Appendix E.

3.3.1 COMPETITIVE DIALOGUE

The main purpose of the competitive dialogue is to enable the public procurer to obtain clarity as to which solutions – technical, financial as well as legal – the market is able and willing to provide. In particular, the competitive dialogue can be used to improve the output-based specifications and risk allocation between the public procurer and the PPP consortium.

The competitive dialogue is a relatively new procurement procedure, which was introduced with the 2005 Procurement Directive. The competitive dialogue is a flexible procurement procedure, which allows the public procurer to discuss the solution of a contract with the potential bidders before their tenders are submitted.

In this connection, the competitive dialogue distinguishes between a dialogue phase and a tender phase. There is a fundamental difference between the two phases:

- In the dialogue phase, the public procurer is allowed to discuss all aspects of the contract with the individual bidders, including financial matters.
- In the tender phase, however, the public procurer is not allowed to negotiate or to have a dialogue with the bidders.

Similarly, when the received tenders are being evaluated, no negotiations may be conducted with the bidders, and only technical clarification and specification as well as adjustment of ambiguous elements in the tenders are allowed in this phase.

The possibilities during the procurement process to carry on a dialogue or negotiations concerning the solutions proposed by the bidders have thus been exhausted at the point where the dialogue phase has been completed and the bidders have been requested to submit their final tenders for the contract.

3.3.2 OUTPUT-BASED SPECIFICATIONS

The output-based specifications outline and describe the services required by the public procurer. They form the basis for the private bidders' proposals as well as the key measure against which the public procurer evaluates the private proposals.

An output-based specification focuses on what the private partner must deliver, but not how it is done. Thus, the use of output-based specifications represents a different approach from the input-oriented activity based on requirements that are applied in traditional tenders.

The purpose of using output-based specifications is to avoid that public-sector specifications limit the private partner's ability, innovation and incentive to deliver the most appropriate and efficient solutions both in relation to the design and construction as well as the operation and maintenance of the asset.

Using output-based requirements enables the bidding consortia to use state-of-the-art innovative solutions as the consortia themselves decide how to build, maintain and operate.

Using output-based requirements also transfers risks from the public procurer to the private partner because the latter assumes the responsibility for the asset meeting the output specifications.

3.3.3 RISK ALLOCATION

The allocation of risk is decided by the public procurer after a competitive dialogue has taken place.

The starting point is that all project risks that the private partner is better at handling are transferred from the public procurer to the private partner, e.g. through the competitive dialogue.

This leads to a detailed quantification (what is the probability that a given event will occur?) and qualification (if the event happens, what loss will it generate?) of the risk, as the consortium will be highly interested in understanding the amount of risk accepted.

The public procurer may or may not agree with the estimation of the risk, but the amount of risk accepted by the private partner and the associated payment (higher return on the project) will be determined through negotiation.

The price of a given risk component will differ, depending on the point of view. There will be one price or cost to the public procurer should the public procurer handle it, and another price or cost to the public procurer should the public procurer transfer it to the private partner. The pricing of a given risk component will be based on each partner's ability to handle, control and mitigate the given risk. This leads to the notion that through the opposing interest of the private partner and public procurer and the subsequent negotiation, the risk will be allocated to the partner best able to carry it. This, in turn, leads to the lowest compensation for carrying the risk.

The evaluation of the total risk transferred to the private partner is subject to comprehensive due diligence by the consortium participants. This due diligence ensures higher budget certainty for the PPP consortium participants.

Implicit in the risk allocation process is the evaluation by the public procurer whether the private partner is sufficiently capitalized to shoulder the accepted risk. As a default on the consortium will have a cost for the public procurer, the public procurer will be diligent in evaluating the financial strength of the consortium. All else equal, the public procurer will seek to minimize the default risk of the consortium, i.e. choose the better capitalized private partner in a bidding process.

3.3.4 LIFE CYCLE ECONOMICS

When acquiring an asset through a life cycle approach, the economics of the full life of the asset is used as bid criteria. In the PPP, this is done through the single contract covering both the design, construction and operation phases. The single contract ensures that the private partner has the correct incentives to choose long-term solutions for design, materials and maintenance.

To maximize the potential for creating value for money the tender material is based on output-based specifications, as discussed previously. The public procurer's need for detailed control is reduced by letting the private partner take full responsibility for all project phases.

3.3.5 PAYMENT MECHANISM

The service delivery specified by the public procurer is monitored through the payment mechanism and the performance monitoring system. The performance monitoring system evaluates the performance of the private partner in relation to the different output-based specifications, and based on these evaluations the payment mechanism determines the exact fee that the private partner should receive for the different services from the public procurer.

The payment mechanism is also the primary means for transferring risks and creating the right incentives in the PPP contract and thus also drives the cost of finance.[9]

3.3.6 CHANGES SUBSEQUENT TO CONTRACT SIGNING

Throughout the contract period there is a need to be able to make adjustments to the performance requirements to continuously accommodate the changed requirements regarding the use of the PPP asset. These changes can be changes in functionality, e.g. conversion of non-teaching to teaching areas in a school, changes in capacity, e.g. adding more classrooms to a school building, or changes in the service or performance specifications, e.g. increasing the recycling target in a waste management plant.

These changes can be costly if the contract does not effectively regulate how to price them. Since it is difficult to anticipate all possible changes over a long-term contract, the PPP model leads to increased risk for the public procurer in terms of potential costly implementation of necessary changes after contract signature. The PPP model addresses this topic through the so-called change mechanism.

3.3.7 COST OF FINANCE

The capital in the SPV is made up of equity and debt. The cost of finance will therefore be driven by the cost and amount of equity and debt.

The amount of debt relative to equity in the SPV is referred to as the capital structure of the SPV. Debt and equity serve different roles in the SPV. Equity is the main carrier of

the project risk. The amount of equity in the SPV corresponds to the overall risk of the project, so that the debt financier has only limited risk exposure. Determining the capital structure and obtaining the required debt for the SPV is part of the consortium's preparation for the project. As debt is normally provided by a non-equity owner in the project, the debt financier will undertake a due diligence of the project to assess the overall risk. This due diligence is a significant factor contributing to the overall timeliness of the PPP project delivery vis-à-vis traditional public procurement models.

The cost of equity will take into account the risk-free interest rate, the fact that the project is an illiquid asset (stemming from transaction costs and risks associated with any sale of equity or debt), and the risk the consortium faces during the design, construction and operation phases.

The cost of debt will take into account the risk-free interest rate, the fact that the project is an illiquid asset, and the risk that the SPV will go bankrupt.

3.4 USE OF THE PPP MODEL

Whether to organize a project through the PPP model depends on the particular project and its circumstances. A few general guidelines can be established for when it should be considered to use the PPP model for a public infrastructure project:

- When O&M costs are considerable and interrelated with initial capital expenditure. This will make the optimization of the total life cycle cost relevant.
- When the infrastructure projects are recurring. This will allow both the public and private sector to drive down cost due to learning curve effects and scale economies.
- When user charges can be employed. This will enable a closed loop situation so that economic incentives are inherently aligned.
- When the stakeholder relations are complex. Project advantages can be optimized in relation to the various interest groups.

The feasibility of the PPP model also differs across the different types of infrastructure.

Transport infrastructure. For this type of infrastructure, PPPs can be employed both in the situation where revenue mainly comes from the government (i.e. payments to the private partner are based on an availability model) and in the situation where revenue mainly comes from user charges.

Utilities. For utilities, a full PPP is most often the right solution and a full PPP is privatization. All risks are transferred to the private sector. The utilities provide a service to the private market with revenue fully or largely covered by user charges, and the economic value of the assets largely driven by general economic developments. Capital asset purchases are based on market-driven principles and financed in private financial markets.

Social and service infrastructure – standard assets. The business of investing and preserving the market value of investments at a national or even international scale is core business for the private sector while it is more of a fringe activity for the public sector. There is a well-functioning market for standard assets, such as office buildings. The public procurer can either lease the asset through the private market or acquire it through a PPP. Whether to lease or build depends on the availability of the demanded asset.

Social and Service infrastructure – custom-built assets. Custom-built capital assets (an opera house, a new broadcasting house) are assets with a limited dual purpose and revenue realistically coming only from a public procurer. For such assets there is little opportunity for a private partner to optimize the commercial aspects of the assets, but a PPP can nonetheless be an appropriate organizational model to improve timeliness and cost control of the project.

TEXT BOX 2:

Value for money and allocation of capital

Value for money is a multi-facetted concept with both internal and external drivers, including timeliness, innovation, quality and cost. From a decision-maker's point of view there is an additional value for money driver in the degree to which sound capital allocation can be made. More projects are often available than capital to undertake them, so political priorities determine which projects are realized.

Underestimating the construction cost of a project and/or the uncertainty associated with the estimate may skew the political priorities, as this results in an artificially high benefit-cost ratio of the projects. This could lead to the following errors:

- A project may be started despite the fact that it is not economically viable.
- A project may be started instead of another project that would have yielded higher returns had the actual costs (and benefits) of both projects been known.

When infrastructure projects exceed budgets they tend to crowd out realization of other projects as a result of an unforeseen lack of resources.

As PPP projects by way of maximising value for money increase the timeliness and cost control of a project, the decision-makers are given higher certainty of the budget and can thus more accurately prioritize among the projects.

TEXT BOX 3:

Value for money of public-private partnerships, Bent Flyvbjerg, University of Oxford

On November 12, 2012 Brisconnection, the operator of the AUD 4.8 billion Brisbane airport link, suspended trading its stocks on the Australian Stock Exchange. Three months later, the company collapsed under its debt after less than half the forecasted revenue materialized. The public-private partnership (PPP) suffered the same fate as Sydney's Lane Cove and Cross City tunnels, and Brisbane's Clem7 tunnel. Australia is not a special case, the US saw the collapse of San Diego's South Bay Expressway, Washington D.C.'s Dulles Greenway, and the Austin-St. Antonio toll road. The UK, the most adamant champion of PPPs, saw the collapse of the London Underground maintenance firm Metronet. The UK government also needed to bail out PPPs in the National Health System.

These and many other PPPs were sold on three promises of better value for money through:

- Better project performance: Building to time and on or under budget,
- More innovation: Improve the quality of infrastructure and services, and
- Risk transfer: Achieve better risk allocation and management.

The PPP failures beg the question: How can PPPs keep their promise?

Firstly, to date, no systematic and robust study has compared the performance of PPPs with conventionally procured projects. Often cited reports showed that three out of four PPPs delivered on time and on budget. Studies that dispute reported that PPPs have 24% higher unit costs and have the same magnitude of cost overruns as traditionally procured projects. However, studies have pointed to several ways how PPPs can improve project performance. Standardization improved project performance particularly where firm engineering standards exist. Conversely, some soft services proved problematic. PPP performance benefited from bundling the project with a prime contractor where a strong central structure existed, which used private-sector expertise, and involved the customer over a long time period. Additionally, overlap between teams and project phases improved knowledge exchange. But the greatest performance improvement lever is incentives. PPPs have delivered faster due to incentives for early delivery, e.g. via "no service – no payment". Revenue sharing has lowered design and construction costs, increased revenue and concession profitability. But bundling PPPs with a prime contractor requires complex and detailed contracts, innovative incentives and performance metrics add further complexity. Public-sector capabilities to administer contracts properly are the biggest hurdle, for example, 36% of the UK NHS trusts have less than one full-time contract manager and 12% of trusts have no contract managers at all.

Secondly, cases of PPPs documented the potential for more innovation in an unexpected way. Evidence shows that the overall level of innovations on individual PPPs is low and tends to be quite generic. Innovation is confined to individual project phases and focuses mostly on short-term cost savings. But evidence shows that valuable inno-

vation can be achieved at the industry level. Breaking up the conventional public-sector monopoly created innovation, motivated R&D investments. Additional innovation has been observed when PPP tenders set challenging constraints.

Thirdly, risk transfer in PPPs is thought to have the potential to offset the higher cost of private finance. Studies showed that risk transfer to private partners has resulted in 10-30% cost savings in several PPP projects. Risk transfer is mainly achieved through a mix of equity and debt. Particularly, equity sharing with subcontractors can have positive effects on the overall project risks. The biggest viability risk, however, is the demand risk, as the Australian PPPs have demonstrated. The inclusion of private capital can increase scrutiny of plans and reduce risks. Independent scrutiny can further curb biases.

In sum, while several PPPs struggle to meet their goals, empirical evidence from academia and practice suggests that PPPs actually can deliver on their promises to improve project performance, to achieve innovation, and to transfer risks. To prevent PPP failure, a strong policy framework with enforcement of accountability is needed. Best practices entail independent project reviews, and enforcement processes, which hold all responsible partners accountable for their actions and inactions. Moreover, strong project and contract management capabilities are needed to equalize differences between the public and private sector. Most of all, the highest potential to create value for money through PPPs lies in industry-level innovation, which ought to be supported by learning between PPPs, as well as learning between the public and the private sector.

Kliplev-Sønderborg motorway

4 OUTPUT-BASED SPECIFICATIONS AND PAYMENT MECHANISM IN THE PPP MODEL

4.1 SUMMARY

The use of output-based specifications enables the consortium to use its competencies and knowledge to optimize the economics of the project and create a clear coherence between the design and construction of the asset and the subsequent operation and maintenance.

Output-based specifications must be precise but not rigid, and the requirements described should be measurable.

The payment mechanism is based on the output-based specification and is tailored to incentivize the private partner into performing well.

4.2 OUTPUT-BASED SPECIFICATIONS

By providing the private partner with an extensive freedom of action in relation to the choice of instrument, methodology, working processes, etc., the private partner is given the opportunity to use state-of-the-art solutions and potentially develop new innovative solutions. This is the key characteristic of output-based specification.

The freedom of action makes it possible for the private partner to use or develop and optimize solutions with respect to the project as a whole. The less strict and inflexible the output-based specifications are the better possibilities the supplier has to use its competencies and knowledge to optimize the project and create a clear coherence between the design and construction of the asset and the subsequent operation and maintenance. The risk associated with the chosen solutions will be completely carried by the private partner, thus making sure the private partner observes the balance between innovation and risk.

Any difficulties that might arise with the fulfillment of the standards in the output-based specifications are the sole responsibility of the private partner.

Output-based specification does not imply that the asset will be constructed with only the technical function in mind. Often the award criteria for the contract will include three overall factors: Price (40-50%), functional and architectural design (30-45%) and organization of the partnership (5-15%). Historically, the architectural design has often made up roughly 50% of the design criteria in Danish PPPs.

It is crucial that the output-based specifications are precise as they are the long-term guarantee that the private partner delivers the necessary services of the right amount and quality. If the output-based specifications are imprecise, it creates uncertainty

about what the public procurer is entitled to in relation to different services, which can challenge the coherence and cooperation of the PPP.

The output-based specifications should not be rigid. If the output-based specifications are rigid and put limitations on the private partner's options, the degree to which the private sector can identify the best solution independently is limited and thus the project will be poorer.

Due to the link between the output-based specifications and the payment mechanism it is also important that requirements are measurable. If the expected output cannot be measured in a manageable way, it can easily cause tension in the PPP and possibly lead to contractual disputes.

4.3 THE PAYMENT MECHANISM

The main purpose of the payment mechanism is to incentivize the private partner to perform well in accordance with the output-based specification and, in case of poor performance, provide the public procurer with options to mitigate the loss and punish the private partner.[10] How well-functioning the payment mechanism is depends on the quality of the output-based specifications. An effective way of creating the right payment mechanism is to take full advantage of the possible dialogues with private partners through the competitive dialogue.

The payment mechanism stipulates at least two things: the unitary charge, which the public procurer is obligated to pay to the consortium as long as the consortium lives up to the output-based specifications; and a penalty mechanism where insufficient performance of the consortium can be translated into an economic penalty.

The unitary charge payment to the consortium does not usually start until the asset is ready to use, and the final payment occurs at contract expiry.

In relation to the design of the payment mechanism, some general guidelines and considerations should be followed or taken into account, respectively, by the public procurer:

- All payments should be dependent on the output from the private partner. In this way, the private partner is incentivized to faster delivery of services of the contractually required quality.[11, 12]
- If the asset is delayed in the construction phase, the delayed time should be deducted from the operation phase. If, e.g., the asset is delayed one year, the operation phase with unitary charges will be one year shorter, leading to a loss for the consortium of a full year's revenue.
- Deductions to payments should be made if the private partner fails to deliver the required services. This creates a strong incentive for the private partner to meet its obligations. For example, a payment reduction can be the consequence of the unavailability of a service.
- Deductions to payments should depend on the expected loss that the authority or users would suffer due to the underperformance.

- Exceeding specified performance standards should not automatically lead to a higher payment. The reason is that when the output-based specifications are outlined, the standards set in the specifications should be the adequate level of performance needed in the PPP. Any performance above these standards would most often be unnecessary and thus not represent value for money.
- Payment mechanisms can also contain a bonus scheme in case the private partner succeeds in meeting all the output-based specifications. This is rarely included in payment mechanisms, but can lead to a stronger and a more cohesive PPP.[13]
- As an alternative to additional payments, the public procurer might award the private partner "bonus points" for over/outperformance, which the private partner can later use to offset "negative points" for performance below the agreed standard.[14]
- The public procurer needs to take reoccurring failures into consideration, when designing the payment mechanism. If the private partner continuously fails in delivering a certain service of the agreed standard this should lead to higher deductions. This gives the private partner a stronger incentive to make long-lasting rectifications and generally focus on durable solutions. When the public procurer incorporates these potential deductions into the payment mechanism it should also take the relevant periods for rectification into consideration ensuring that they create the right incentive structure.[15, 16]
- The public procurer should consider transferring as much demand risk to the private partner as economically viable.

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5 RISK ALLOCATION IN THE PPP MODEL

5.1 SUMMARY

Risk is a fundamental factor in a PPP contract. The negotiation and subsequent allocation of risk between the public procurer and the consortium is a defining characteristic of PPPs, where the consortium accepts very significant risks related to the design, construction and operation of the project. The risks usually transferred are risks which the private partner is able to control or effectively mitigate. The strong focus on risk is also visible from the default rates of PPP bonds, which are low relative to other project finance bonds, underscoring how PPP is able to handle risk better than most other infrastructure organization models.

5.2 DEFINITION OF RISK

Risk is "the chance of an event occurring which would cause actual project circumstances to differ from those assumed when forecasting project benefit and costs" (Partnership Victoria: 2007).[17]

The treatment and allocation of risk varies in the different organizational models for public infrastructure projects. From playing a minor role in the traditional procurement models, which are often procured through a number of contracts under detailed input specifications (e.g. public procurer buys infrastructure), risk plays a very central role in PPP models that are procured based on output specifications (e.g. public procurer buys services) and one single contract covering financing and all project phases from planning, design, operation & maintenance until contract expiry – typically a life cycle of 15-30 years.

In a traditional procurement model the main emphasis has historically been put on the availability of funding and whether the obtained debt could be serviced by cash flows from the asset or from the public procurer. This approach is liable to ignore important risk factors in the project, which leads to cost and time overruns as discussed in Appendix D. Instead, by allocating the risks of the project to either the public or private partner, the risk is clearly identified, examined and valued. Where the public procurer implicitly accepts almost all risk in the traditional procurement model, the valuation of a given risk opens up for a qualified distribution of the risk in a PPP, adding significant value to the project. The allocation of the risk is the subject of this chapter.

By taking the private partner's approach, this chapter will not necessarily deal with all aspects of risk as seen from the public procurer's point of view.

5.3 TYPES OF RISK

Below are descriptions of eight typical risk categories. Other categories exist and, depending on the project in question, some risk factors may switch category. The list is not exhaustive but is an introduction to the types of risks relevant in infrastructure projects. The list includes:

- Construction risk
- Political risk
- Legal risk
- Procurement risk
- Financial risk
- O&M risk
- Availability risk
- Demand risk
- Other risk

Construction risk covers events related to the construction state of the asset involved in the PPP and is in practice related to events such as late delivery, non-compliance with specified standards, significant additional costs, technical deficiency and external events (including environmental risks) triggering compensation payments to third parties.

Political risk is the risk related to the political aspect of the project. These risks include risk of difficulties with land acquisition/expropriation, political opposition to the project, and the risk of a poor public decision-making process, which will expose the project to claims and lawsuits. The public procurer is normally considered to bear the political risk when factors defined in the contract as political risk obstruct the project flow, such as revoking building rights due to process errors in the political system when granting them in the first place. These risks are largely outside the control of the private partner but can be mitigated by proper policy planning by the public procurer. Thus, the political risk is often retained by the public procurer.

Legal risk covers the risk of legislative changes, the risk associated with project approvals and permits, tax legislation and potential liabilities generated by the project. The nature of the legal risk is diverse and there is not a single source of the risk. The allocation of the legal risk would often be done on a case-by-case basis, taking into account what partner best can control the risk and the source of the risk.

Procurement risk is the risk associated with the procurement process. These risk factors include risks arising from the organizational form (lack of experience with the PPP process, lack of commitment from the public or private partner), coordination risks between the public and the private partner (interface risk), excessive contract variations and late changes to the design. As with legal risk, the sources of these risk factors are multiple and no partner is better at handling them all than the other. Consequently, each risk must be addressed separately in the negotiations and allocated accordingly before it can be determined which partner carries the largest risk.

Financial risk is the sum of the risk factors concerning the financing of the project. These factors include the risk of high inflation volatility (more precisely, the risk of inflation being higher than estimated), interest-rate volatility, refinancing risk and the overall performance of the economy. Since the private partner can set its financing structure as it sees fit, and the degree to which the change in financial variables affects the project is primarily influenced by the chosen financing structure, the financial risks are normally expected to be carried by the private partner even if there are examples of projects where the public procurer and the private partner share the refinancing risk. The financial risks are furthermore a type of risk that can be transferred out of the consortium. A private market exists for financial derivatives, and while interest-rate swaps or inflation hedges may not exist with maturities for the full project lifetime, significant parts of the risks can be hedged through third-party contracts if the consortium chooses to.

O&M risk can be decomposed into two parts: The cost of poor construction decisions materializing in the O&M phase and risks arising as a function of the operation of the asset. The alignment of the financial interests of all parties in the consortium incentivizes the reduction of the risk arising from poor construction decisions. The other part of the O&M risk is the decline in the standard of the asset due to use of the asset and any extraordinary declines due to unforeseen events. The estimation of the necessary effort and cost to keep the asset up to a certain state comes with some uncertainty, which leads to the risk. Generally, the overall O&M risk is always transferred to the private partner, although certain minor elements of the risk can be retained by the public procurer. The O&M is transferred to the private partner because it is significantly influenced by other factors transferred to the private partner (design and construction) and because the transfer of the O&M risk is a fundamental part of the life cycle perspective. If the O&M risk is not transferred to the private partner, the incentive to design and build infrastructure with efficient life cycle costs is reduced.

Availability risk covers situations where, during the operation of the asset, the responsibility of the private partner is called upon, because of insufficient management performance, resulting in a lower volume of services than was contractually agreed or in services not meeting the quality standards agreed in the PPP contract.

Demand risk covers the variability in demand for a particular service, like the number of road users or volume of waste disposal (deviations for one reason or another from what was expected when the PPP contract was entered into) irrespective of the performance of the private partner. In other words, there is a demand risk when a shift in demand cannot be directly linked to availability or an inadequate quality of the services provided by the private partner but is the result of other factors, such as business cycles, new market trends, changes in user preferences or technological obsolescence.

Other risk is the residual risk related to the project which is not explicitly allocated to the public or the private partner. There will always be residual risk related to the project, including force majeure, which is often shared or transferred to a third party through insurance.

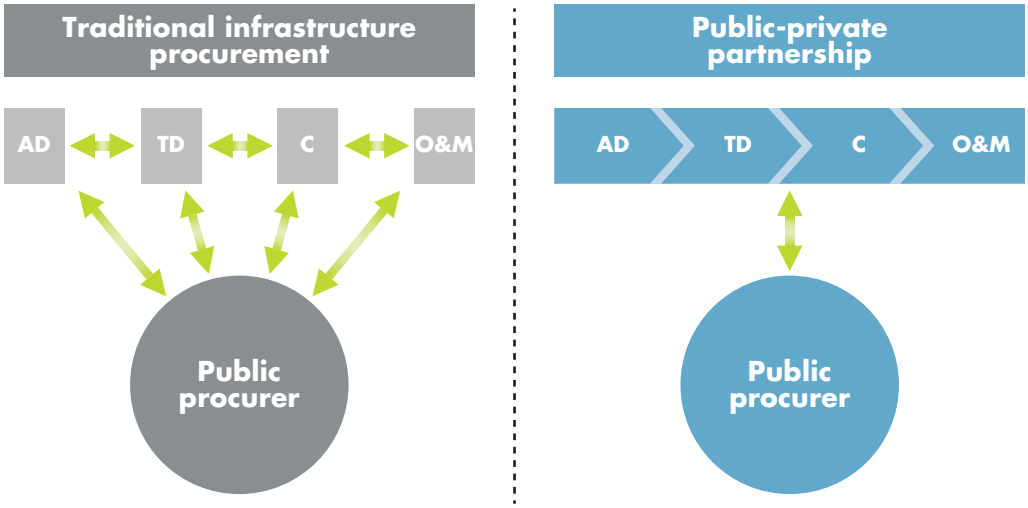
5.4 UNDERSTANDING RISK IN PPPS

A main characteristic of the PPP is the adamant focus on risk through the whole process. This is a result of two factors: the structural factor and the incentive factor.

The structural factor covers the risk mitigation mechanisms which come about as a result of the effects of a PPP, which are not directly influenced by either of the partners' actions. They are, in other words, intrinsic to the PPP model rather than a result of the partners' actions.

The most predominant of these is the contract setup. A PPP is procured through a single contract that covers all the involved private suppliers, giving them a collective responsibility for the project from cradle to grave with respect to service quality and life cycle cost. As Figure 10 illustrates, the single contract leads to less interface risk for the public procurer, as the risk of e.g. the architectural design not being possible to build rests with the consortium rather than the public procurer. Thus, the single contract of the PPP ensures that the full project from architectural design to operation and maintenance is technically feasible and economically viable.

Figure 10: **Risk interfaces with PPP and traditional procurement**



↔ Risk interface where the public part holds the risk
AD Architectual design
TD Technical design
C Construction
O&M Operation and maintenance

The second and more complex factor is the incentive factor, which is an aggregation of all the choices and agreements made between the public procurer and the private partner as a result of the allocation of the risk in the contract. The negotiation and subsequent allocation of these risks will be a function of the price that the public procurer can negotiate for transferring the risk to the private partner.

A defining characteristic of a PPP is the significant risk carried by the private partner. It is often expected, and indeed a requirement if the PPP project is going to be on the private balance rather than the public balance, according to Eurostat, that the private partner carries the majority of the construction risk; in reality, all risks that can reasonably

be controlled/managed by the private partner. In addition, significant risks in the O&M phase, often related to availability or demand, are generally carried by the private partner. The risks normally carried by the private partner vis-à-vis the public procurer will be discussed further below in this chapter.

The incentive created by the risk sharing is two-fold. First, the consortium is interested in maximizing the certainty of the project, thus minimizing the risk of the profit of the project, which means qualifying all relevant risk parameters in the project before submitting a proposal (or including a premium to cover risks, which cannot be quantified). Second, the private lender will undertake an independent due diligence of the project to ensure that the actual risk level of the project corresponds to the agreed risk level.

These due diligences (consortium and lender) are significant contributors to the value of private finance.

The private partner's role and therefore potential risks can vary significantly within the same general PPP framework, as reflected in Figure 11. There can be a number of non-delegable duties in the service deliveries to the users provided by the private partner, for which the public sector cannot transfer the legal responsibility. This may even be the case in situations where the economic responsibility can be transferred and backed e.g. by the insurance of the private partner. One example is road safety and police speed control; while the private partner in a PPP can hold the responsibility regarding correct signaling of speed limits and that the road is open (i.e. no accidents to block the traffic); the enforcement of the law is not delegated to the private partner. Another example is construction and operation of prisons, which for the majority of the tasks involved can be done by the private partner, but any use of force is left with the public authorities.

Figure 11: **Ernst & Young based on "Partnership Victoria – range of PPP models"**

	The role of the private partner in the project			
Role	Least involved			Most involved
Private partner	Infrastructure service only	Infrastructure and ancillary services	Infrastructure and partial private-to-public service delivery	Infrastructure and service delivery to end users
Public partner	All public-to-public services	Delivery of all core public services	Delivery of most core public services	No operational role
Example	Public buildings, administration, schools	Non-core hospital services, non-judicial court services, non-core school services, e.g. cleaning services	Community facilities linked to educational facilities e.g. after-hours usage of sport facilities	Roads, rail, port facilities, car parks
Comment				If the partner has the demand risk and recives payment directly from end users the PPP may be a concession

The risk picture in a given PPP will shift during its different phases. The majority of risks will be concentrated around the construction phase, where conditions such as design, foundation, unforeseen delays and land acquisitions and permits are significant risk factors.

The construction phase is followed by the start-up phase, where the risk shifts from construction to demand and/or availability.

5.5 ALLOCATION OF RISK

The contract set-up coupled with the output-based specification covered in chapter 4 implies a significant transfer of risks from the public procurer to the consortium. This includes risks related to design, construction, operation and maintenance. The transfer of risk from the public to the private partner does not include a loss of control over the asset as the PPP contract requires the asset to meet very specific functional requirements during the contract period as well as when the contract expires. Consequently, a significant proportion of the risk is transferred from the public to the private partner.

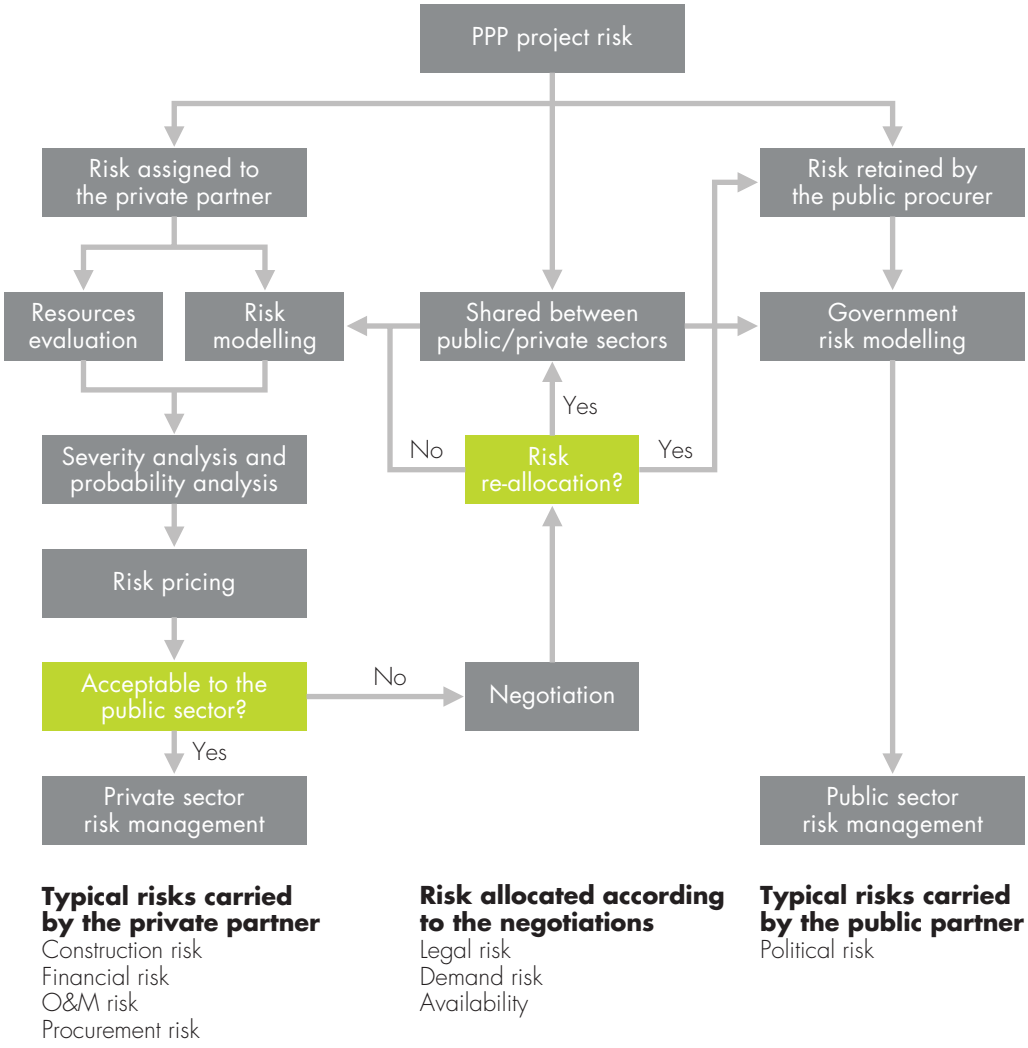
In practice, the decision on how to allocate risk between the public and private partner will be carried out subject to the degree of value for money that is created for the public procurer from the specific PPP project when shifting the risk allocation. In practice, the allocation of risk between the two parties takes place in competition between the various bidders as part of a competitive dialogue or negotiation. This is based on the principle that the partner that handles and controls a certain risk most adequately also would be the partner that could manage the risk with the lowest resulting cost. The value for money topic is examined further in chapter 3.

Through negotiations, the risk will be distributed factor by factor to either the public or the private partner or split between them. The risk accepted by the private partner is distributed in the consortium based on the constituents of the consortium's abilities to carry the risk. Ultimately, the decision as to who carries what risk is decided by the associated cost – monetary or non-monetary – with the exception of the residual risk: As the project is transferred to the SPV, any residual risk (i.e. risks not identified in the contract) will rest with the SPV, successively the consortium. This helps incentivize the consortium to undertake risk analysis and allocation diligently. See Figure 12.

In a PPP project funded by Danish pension funds, the pension funds provide the majority of the capital in the SPV. This implies that the pension funds will play a central role when risk is allocated for two reasons:

1. Capital at stake: It is possible to issue dual-class shares and ask the contractor and facility manager to put up equity in front of the equity and debt provided by the pension fund. This will incentivize the contractor and facility manager even further to manage all risks; but the amount of capital provided through this facility is most likely insufficient to guard the pension funds from loss should a significant negative event occur. Consequently, the pension funds will have capital at stake and thus be diligent in their approach to the project evaluation.
2. Ability to manage: Constructing a tangible asset or operating it is not within the core competencies of a pension fund. Consequently, pension funds will look to transfer all risks associated with design, construction and operation of the asset to the contractor and the facility manager. Thus, the pension fund will not accept a substantial part of the risks unless they are accepted by either the architect, the technical designer, the contractor, or the facility manager in the consortium.

Figure 12: **Li et al. 2005 with Ernst & Young additions**



5.6 EMPIRICAL RISK ALLOCATION

The empirical risk management is two-pronged. Evidence from academia examines the intra-project risk allocation, while evidence from the capital markets examines the characteristics of the project leading to reduced default risk. Researchers have conducted a survey of the allocation of risk in PPP/PFI projects in the UK.[18] Their survey includes 53 PPP/PFI projects in the UK and asks which risk factors were carried by the private partner vis-à-vis the public procurer. The projects are primarily within the education system (13), transportation (11) and the hospital sector (9). The survey results are shown in Figure 13.

Figure 13: **The allocation of risk in PPP/PFI construction projects in the UK; Li et al. 2005 with Ernst & Young risk type classification**

Risk factor	Preferred allocation	Total respondents		
		Public (%)	Private (%)	Shared (%)
Nationalisation/expropriation	Public sector	79	9	12
Poor public decision-making process		69	7	24
Political opposition		63	21	16
Land acquisition/site availability		61	12	27
Unstable government		58	25	17
Traditional public opposition	Strongly dependent upon project	46	42	13
Project approvals and permits		35	32	33
Excessive contract variation		33	26	41
Lack of experiences in PPP/PFI arrangement		13	43	43
Responsibilities and risk distribution	Shared	0	23	77
Force majeure		18	13	68
Authority distribution between partners		4	29	67
Lack of commitment from public/private partner		24	10	66
Legislation change		17	22	61
Tax regulation change	Primarily to the private sector	18	51	31
Late design changes		26	53	21
Residual risk		22	55	23
Inflation rate volatility		7	56	37
Lack of tradition of private provision of public services		27	59	14
Staff crises		7	60	33
Third party tort liability		3	60	37
Influential economic events		8	69	22
Financial attraction of project to investors		3	70	27
Level of demand for project		8	73	19
Different working methods		0	73	27
Industrial regulation change	Solely to the private sector	0	75	25
High financing cost		3	76	21
Interest rate volatility		2	78	20
Organisation and co-ordination risk		0	80	20
Weather		0	82	18
Environment		0	84	16
Availability of finance		0	85	15
Geotechnical conditions		5	87	8
Operational revenue below expectation		3	89	8
Poor financial market		0	89	11
Poor quality of workmanship		3	92	5
Construction cost overrun		0	92	8
Frequency of maintenance		0	92	8
Availability of labour/material		0	94	6
Insolvency of subcontractors/suppliers		0	95	5
Low operating productivity		0	95	5
Design deficiency		0	95	5
Unproven engineering techniques		0	97	3
Operation cost overrun		0	97	3
Higher maintenance cost		0	97	3
Construction time delay		0	98	2

Some results are as expected: Construction time delay and cost overruns are carried exclusively by the private partner as is design deficiencies. In 89% and 73%, respectively, of the projects the private partner is solely responsible for operational revenue below expectations and for the level of demand for the project. This indicates that UK private PPP partners are willing to take on considerable demand risk. In accordance with Figure 13, the residual risk associated with the project is allocated to the private partner in 55% of the projects and shared in 23% of the projects; only in 22% of the cases is the residual risk left with the public procurer.

At the other end of the scale, the public procurer accepts risks concerning expropriation and land acquisition, poor decision-making process and political opposition. Site availability also rests with the public procurer, but unlike the political system risk, this is a real risk with significant impact. Since the public procurer has broad experience in making a construction site available to a contractor, the risk is best handled under the public procurer's auspices (risk management).

Surprisingly, the risk of project approvals is shared evenly between the public procurer and the private partner as well as force majeure and legislative changes. Legislative changes are shared as the public procurer will carry the risk of project-specific legislative changes, while the private partner will carry the risk of general legislative changes.

Out of 46 identified risk factors 32 should preferably be assigned to the private partner.

In addition to a qualitative study of the division of risk in a PPP, Moody's have examined the typical characteristics of PPP/PFI financing from a quantitative approach. Moody's have observed characteristics which, when implemented, decrease the risk and thus the cost of capital. These include:

- The construction risk should substantially be transferred from the SPV to the construction contractor e.g. through a turnkey contract, which stipulates an agreed timetable, budget and functional requirements to meet.
- The counterparty risk the SPV has against the contractor should be hedged through financial instruments such as a bank letter of credit or other guarantees, e.g. performance and/or parent guarantees.
- Structures to mitigate liquidity risk should be in place. These include covenants, reserving mechanisms and cash traps and should allow the SPV to withstand momentary shortness of cash.
- The SPV should be subject to a covenant structure, which prohibits the SPV to evolve outside the agreed business plan, thus underlining the predictable trajectory of the business and the cash flow.
- Ideally, the transaction should be structured in such a way that refinancing risk is avoided by rising all necessary funding at the initial financial close.
- The revenue stream should be predictable and resilient with a long time horizon, especially where the revenue risk is transferred out of the SPV through an offtake contract.
- The bid (meaning the basis for the contract) should include detailed appraisals for O&M costs over the lifetime of the contract as well as any necessary reinvestment of capital equipment.

- The lender should have detailed due diligence carried out by the necessary professionals – technical advisors, market consultants, legal advisors, insurance advisors, accounting and tax advisors, and others. Any and all issues raised should be addressed to the lender's satisfaction.
- Detailed review by lenders of all parts of the project including negotiation of key terms to ensure that all risks are identified, allocated and mitigated such that the residual risk is reduced to an acceptable level.
- The lending decision should be made based on a detailed financial model including base case assumptions and testing the project's resilience towards severe downside events. The financial model would typically be audited before financial close.
- Proactive monitoring of the SPV by the senior lenders – the available information is typically better for an SPV in a PPP project than for traditional corporate borrowers

The lower default rate of PPPs could be explained by the tripartite agreement or direct agreement which is entered into between the public procurer, the PPP provider and the PPP provider's financial partners. The purpose of the tripartite agreement is to secure the financial partners by allowing them to become a partner to the PPP contract to ensure its performance vis-à-vis the public procurer. During this period, the public procurer will thus suspend the usual remedies for breach in order to prevent and remedy the non-performance of the performance requirements according to the PPP contract.

Although the PPP contract precisely defines the distribution of risk and responsibilities in the operation phase, the contract normally also defines periodic reviews of the asset carried out by the private partner and public procurer together, which is also a means of risk mitigation. Obviously, the early years after the construction completion are the most risky of the operation phase since the problems with the asset arising in this phase most certainly result from flaws related to design, construction and/or technical installations and construction. These types of faults are typically expensive to repair. As time goes, the risk shifts, and errors will typically be related to lacking or erroneous maintenance rather than construction errors and are most often cheaper and easier to correct. Figure 14 shows an example of the cost-risk curve of a typical PPP. The graph is supported by a study by Moody's, which concludes that:

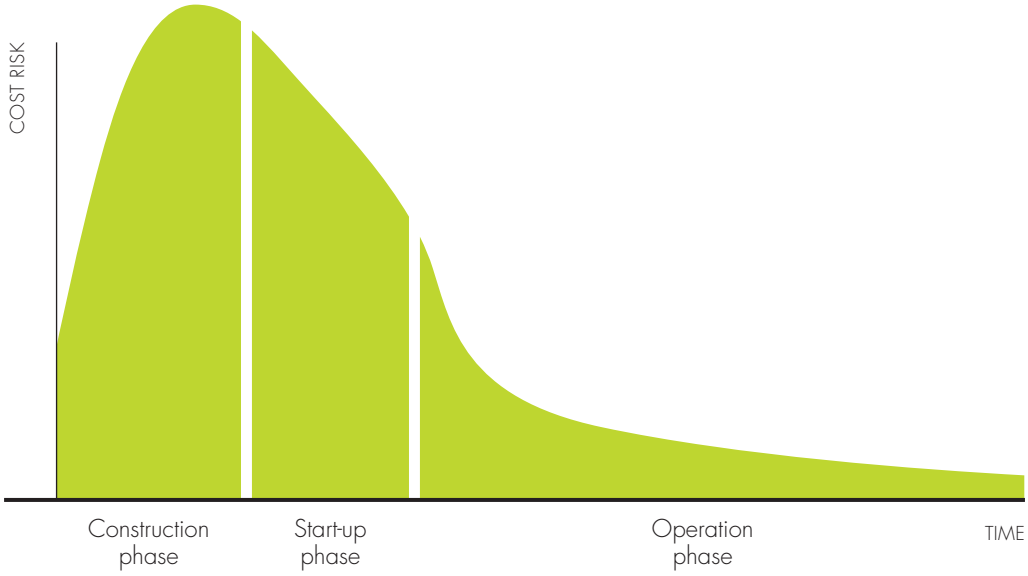
> "The 10 year cumulative default rate on PFI/PPP loans is consistent with the 10-year cumulative default rate on low investment-grade/high speculative-grade loans
>
> The marginal default rate on the initial three years of the loans following financial close is consistent with the default rate on high speculative-grade default rates.
>
> The marginal default rate drops significantly after the initial three years and converges with default rates on A-rated loans 10 years after the financial close"[19]

This is consistent with the qualitative analysis that the PPP project risk is right-skewed over time; meaning that the majority of the risk is located at the beginning of the project. The recovery rates of the loans further underline this as the recovery rate of the PPP/PFI loans averaged 79.9%. This is composed of a recovery rate of loans defaulting during the first three years after financial close of 65.8% and a recovery rate of loans defaulting in the operation phase of 83.2%.

The recovery rates for PPP/PFI loans are consistent with the recovery rates on senior secured corporate bank loans, but the PPP/PFI loans are uncorrelated with key determinants for corporate bank default rates, specifically the legal jurisdiction of the defaulted company, the presence of contractually subordinated debt and default rates.

While the numbers are not conclusive as the sample group only contains a limited number of projects with few defaults, the numbers seem to support the industry practitioner's point of view that PPP/PFI is a relatively low-risk investment in the project finance spectrum.

Figure 14: **Example of cost risk over the project life cycle**



The default probability of a PPP financing is generally very low. Moody's calculated the 10-year cumulative default rate at 3.83%, which is lower than the general default rate for project finance loans to the infrastructure sector at 4.72%. Furthermore, the ultimate recovery rate of PPP financing given default is 87%, which is significantly better than the average project finance recovery rate of 79.9%, and underlines the view held by many practitioners that PPP financing is in the low-risk end of the project finance spectrum.[20]

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6 LIFE CYCLE APPROACH IN THE PPP MODEL

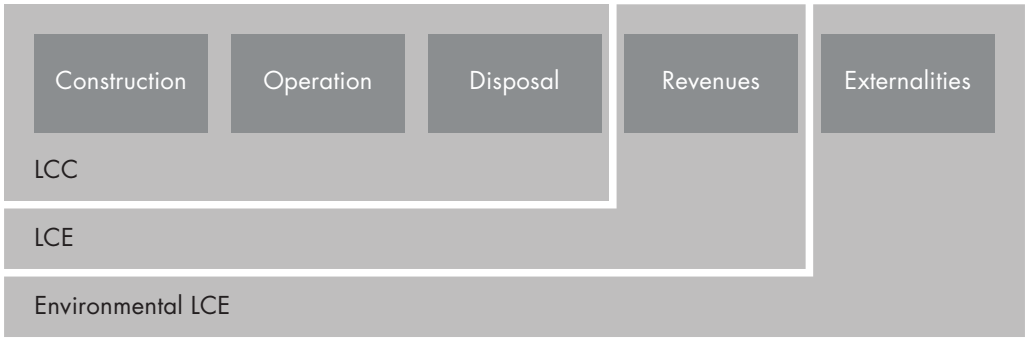
6.1 SUMMARY

Life cycle economics (LCE) is a technique which enables comparative economic assessments to be made over a specified period of time, taking into account both initial capital costs, future operational costs as well as any future revenue. The application of life cycle economics is the element in the PPP model that in monetary terms ties some of the most important elements of the PPP model together with the aim to increase value for money.

6.2 DEFINITIONS

A life cycle approach can be more or less comprehensive. Below are three definitions encompassing costs, revenues and externalities, see Figure 15.

Figure 15: **Relationship between LCC, LCE and environmental LCE**



Life cycle costing (LCC) is a technique which enables comparative cost assessments to be made over a specified period of time, taking into account life cycle cost that includes initial capital costs and future operational costs.

Life cycle cost includes the costs of planning, design, acquisition, operation, maintenance and disposal, less any residual value. The life cycle cost includes internal resources and departmental overheads, where relevant; it also includes risk allowances as required; flexibility, refurbishment costs and costs relating to sustainability and health and safety aspects.[21] The elements of the life cycle cost are those needed to achieve defined levels of performance, including reliability, safety and availability over the lifetime of the infrastructure asset.

Most of us use the process of LCC consciously or sub-consciously in our normal purchasing activities. For example, when we buy a car, we assess the initial price together with its running costs including expected maintenance costs, fuel costs and costs related to replacement of components that time-expire (e.g. brakes) as well as the residual value on disposal or sale.

Life cycle economics (LCE) is a technique which enables comparative economic assessments to be made over a specified period of time, taking into account both initial capital costs, future operational costs as well as any future revenues expressed in monetary value. LCE calculates the capitalized life cycle economics, i.e., the present value of the future expected cost and revenue cash flows. When there are no revenues associated with the infrastructure asset, then LCE becomes equivalent to LCC.

Environmental LCE takes into account the external environmental costs in addition to costs and revenues. The environmental costs could include for example the external costs of global warming contribution associated with emissions of different greenhouse gases.

Life cycle considerations in a PPP can include all three variations. In a PPP where compensation is based on availability, the life cycle approach will typically be LCC. A PPP, where demand risk is transferred to the private partner, will be LCE while cases where the public procurer requires non-monetary effects to be included in the payment mechanism will lead to the environmental LCE.

6.3 LIFE CYCLE APPROACH AND THE BID MODEL

A life cycle approach implies that the capitalized life cycle cost or economics of the asset is used as a key bid criterion. In practice, the consortium calculates the capitalized life cycle cost or economics of the asset in a so-called bid model. Once a preferred bidder is selected, the information in the bid model is incorporated into the PPP contract.

In the PPP model, the life cycle approach often takes the form that bidders provide a quote for their required unitary payment. In this way, the public procurer will be provided with the annual total costs it will face for using the asset.

During the construction and operation of the asset, the bid model is updated to reflect any changes or variations in the project. The bid model is updated throughout the contract period and can be used as a tool for managing maintenance and replacement works. The public procurer may also use the bid model as part of a monitoring tool to ensure the necessary works are being carried out.

The core process of LCE is summarized in Figure 16.

In connection with the tender stages, the public procurer will often produce a project bid model, which the consortia are required to use when submitting bids. This will ease comparability of the submitted bids.

Figure 16: **Core process of LCE and bid calculation**

6.4 APPLICATION OF LIFE CYCLE APPROACH DURING THE COMPETITIVE PROCESS

The application of the life cycle approach is the element in the PPP model that ties three important elements of the PPP model together with the aim to increase value for money: output-based specifications, functional requirements, and the risk transfer.

The opportunities for achieving optimal life cycle costs or economics are greatest if the LCC/LCE analysis is made in connection with the design and construction of the asset. To a large extent, decisions with major impact on the life cycle economics will have been made during the initial concept phase. However, there is also a beneficial effect of adopting a life cycle approach in connection with brownfield PPPs.

For example, building orientation will influence the amount of solar heat gain and level of cooling required and the degree of shading; floor plate depth will influence the decision on whether the building needs to be air-conditioned as opposed to naturally ventilated; levels of insulation and air tightness will affect heat loss and energy costs; the number of floors will impact on costs of access for cleaning and maintenance; the number of entrances will influence the level of security.[22] Thus, the sooner the life cycle costs or economics are considered, the greater the opportunity for creating best life cycle value.

6.5 APPLICATION OF LIFE CYCLE APPROACH DURING THE CONTRACT LIFE

The life cycle approach is visible beyond the design and construction phase. After the contract between the public procurer and a consortium has been signed, the consortium is still incentivized to carry out actions that aim at optimizing the economics of their investment. This is due to the long-term nature of the contract covering both the construction and the operation phase. If new technology, e.g. for insulating windows, becomes available during the lifetime of a PPP contract for a school and if there is a positive net present value for the consortium to carry out the change, then the rational decision for the consortium will be to carry out the change. In this case the public procurer could get part of the economic upside by lowering the unitary charge. This way of sharing the upside could be described in the change mechanism.

A way to further incentivize the use of the life cycle approach during the lifetime of the contract would be to implement contract clauses that obligate the public procurer and the consortium to consider improvements with a positive net present value seen over a

period that goes beyond the end of the contract. E.g. if new technology for insulating windows only becomes available a few years before the end of the contract, it might not generate a positive net present value for the consortium to change windows, even if it would for the public procurer, as they would own the asset after the expiry of the contract. This would be addressed through specific clauses in the payment and change mechanisms.

Nordstjerneskolen (school in Frederikshavn)

7 CHANGE MECHANISM IN PPP PROJECTS

7.1 SUMMARY

The long-term nature of the PPP contract entails that the output-based specifications set out in the contract should take into account the public procurer's short- and long-term requirements. However, requirements may change during the duration of the contract that cannot be anticipated. Therefore, a framework for managing change requests must be agreed upon by the public procurer and the private partner.

7.2 THE IMPORTANCE OF CHANGE MECHANISMS

The PPP contract usually covers many years, upwards against 30 years for some projects. There is a significant challenge in estimating the future needs and demands of a given asset before it is even constructed, so ensuring sufficient flexibility at a reasonable cost is important. Experiences from the UK show that more than half of PPP contracts had been altered within three years after the contract letting,[23] underlining how important it is to be able to manage changing requirements during the course of the contract.

If the PPP contract does not effectively deal with a change in requirements, it could prove costly for the public procurer to make alterations in the already agreed output-based specifications, thus reducing the value of the organizational form of the PPP for the public procurer.[24]

The change mechanism should provide the necessary incentives to carry out economically attractive changes. Gains resulting from changes and adjustments to the performance requirements should be shared on terms which also make it attractive for the PPP consortium to be continuously attentive to the possibilities of optimizing the overall project economy.

In a PPP with a suitable change mechanism, the public procurer is entitled to request changes. The specific terms for managing change requests are set out in the PPP contract and in the rules of procedure of the partnership. These are usually prepared as an appendix to the PPP contract and govern the partnership during the construction and operation stage, respectively.

The PPP consortium should be entitled and, depending on the circumstances, obligated to propose changes to the performance requirements, e.g. if changing the performance requirements may lead to an optimization of the overall project economy as a result of technological advances.

The changes that can be anticipated or addressed upfront can be subjected to competition during the bidding phase. This could potentially lead to a better price than if the change in service is adapted through the use of a change mechanism later on.

7.3 OUTLINE OF FRAMEWORK FOR MANAGING CHANGE REQUESTS

Contract changes initiated by the public procurer should provide sufficient compensation for the PPP consortium to ensure that it does not incur losses as a result of the contract change.

When constructing the change mechanism, a useful framework to classify the change requested can help analyze the impact and subsequently the price of the requested change. HM Treasury suggests a framework for classification of a given change request, see Figure 17.

Figure 17: **Classification framework for change requests**

Classification	Options
Origin	Private consortium
	Public procurer
	Changes in law
Timing	Construction phase
	Early operation
	Steady state operation
Value	Small
	Medium
	Large
Impact	Financial
	Works
	Service
	Works and service
Type	Change in functionality
	Change in capacity
	Change in service specifications and/or standards

Source: HM Treasury

Origin and timing. Changes requested by the public procurer during the operation phase should be accepted and implemented, while public requests in the construction phase should be minimized as they are often prone to endanger the project economy of the consortium. The private partner should only propose changes in cases where further optimization is possible, and the public procurer should always have the ruling power.

Value. How to classify the value of a change request depends on the size of the project overall, i.e. the classification is relative. Generally, small and medium-sized changes should be handled and implemented relatively quickly and at low cost, while large changes should necessarily undergo appropriate due diligence and negotiations before they are undertaken.

Impact. Service-related changes impacting the facility manager are usually easier to accommodate relative to changes involving additional civil works or construction, which usually requires involvement of senior lenders, etc.

Type. Changes in the use or functionality of an asset usually do not create a significant impact value and can be done fairly easy, whereas changes in the capacity of an asset most likely involve additional civil works, leading to a much more complex problem.

HM Treasury suggests that the change protocols in the contract should include the following elements:[25]

- Notification and specification
- Contractor's estimate
- Authority approval
- Change implementation
- Funding and payment
- Due diligence
- Documentation and monitoring

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8 COST OF FINANCE IN THE PPP MODEL

8.1 SUMMARY

The cost of finance in a PPP can be decomposed into three pillars: the risk-free rate, the risk premium and the illiquidity premium.

The risk-free rate is the baseline for the project finance, regardless of organizational model. The risk premium is the compensation that the private partner requires to accept the risk transferred from the public procurer to the private partner. The illiquidity premium reflects the higher transaction costs of a PPP investment relative to alternative asset investments, such as a government bond.

The increased cost of finance of a PPP relative to traditionally organized infrastructure projects is for the majority a function of the risk transfer. Transferring the risk implies valuation of the risk, which in turn is observable in the cost of capital. In other words, the increased cost of finance in a PPP is comparable to the cost and time overruns frequently observed in traditional infrastructure models.

8.2 CAPITAL STRUCTURE AND COST OF FINANCE

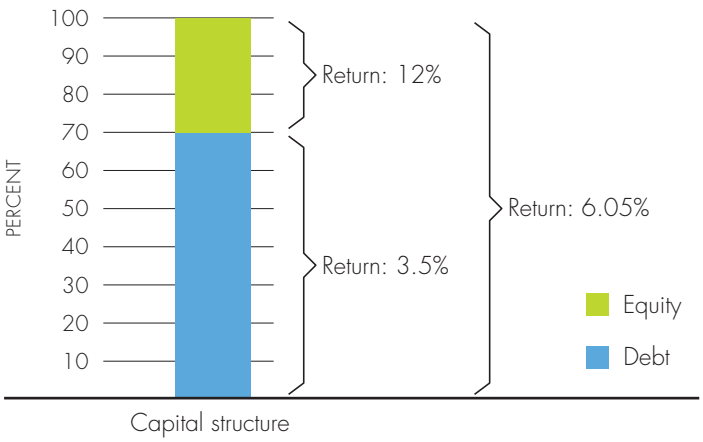
Financing and cost of finance are the primary concerns of critics of the PPP model. This chapter outlines the characteristics of private finance and hybrid models with particular focus on illiquidity and risk premiums and illustrates this by an example of the connection between risk and cost of finance.

It is clear that the cost of finance in the PPP model should be minimized as this is a competitive parameter. In the PPP model the cost of risk is subject to negotiation between the public procurer and the private partners in a competitive setting. Therefore, the PPP model facilitates a process whereby the cost of risk and, in turn, the cost of finance is minimized.

The cost of private finance can be calculated by tranching the capital structure with respect to the risk of the contract. The risk differs across the capital structure for several reasons, two of which are discussed below:

1. If the realized profit from operation is less than forecasted (lower-than-expected traffic or higher-than-expected cost of maintenance), capital should be available in the SPV to absorb the loss.
2. The payment mechanism stipulates a certain amount that the private partner is entitled to in case of termination of the contract by the public procurer. If the contract termination is initiated by the public procurer, the debt can be fully compensated. If the termination is due to default by the private partner, the public procurer will usually only compensate part of the debt and none of the equity, but even in that case the post-restructuring value of the SPV for the investor will most likely be larger than 0.

Figure 18: **Example of capital structure**



Consequently, applying a uniform cost of finance for the whole capital structure will not be appropriate.

The cash flow guaranteed by the public procurer in the termination clause in the contract will have the same rating as the rating of the public procurer and should subsequently be valued at the same discount rate,[26] while the more risky marginal return on the project, e.g. the marginal return for 20.000 cars rather than 19.000 cars passing through the harbor tunnel each day, should be valued using a cost of equity-equivalent cost of finance.

Furthermore, by tranching the capital, the consortium is able to tie together the interests of the subcontractors (contractor and facility manager) and the financier. By asking the subcontractors to supply equity capital to the SPV, the financier ensures that any loss incurred by the SPV will also hit the subcontractors. Consequently, the tranching of the capital enforces the alignment of the partners' interests in the SPV. See Figure 18.

The risk factors of the project will be reflected in the overall cost of capital. Furthermore, the overall cost of capital will be subject to competition similar as a function of the overall project economy, and while private finance seldom is cheaper than public finance, the cost of finance in a private finance scenario will reflect the cost of the risk carried by the private partner. This conveys important information to the public procurer about the riskiness and overall feasibility of the project.

8.3 COMPOSITION OF PRIVATE FINANCE

The private cost of finance can be broken down into three pillars: the risk-free rate, which is the basis for all capital, a risk premium and an illiquidity premium. See Figure 19.

8.3.1 THE RISK FREE RATE AND THE ILLIQUIDITY PREMIUM

A private investor can choose between investing in listed or unlisted assets. Listed assets have prices available from the exchanges and incur low transaction costs.

The yield on a long bond is often used as a proxy for the risk-free rate. The assumption behind the return on a risk-free investment is that a given investor can quickly buy and sell the asset, i.e. a government bond, without significant transaction costs (time and money).

Private capital invested in a PPP is not liquid, since the private investor will not be able to sell the investment in the market.

If the investor wants to sell an investment, he must first find a willing buyer and complete negotiations before the deal can be signed. The price the private investor will be able to obtain is a function of several factors, including the number of bidders for the investment. Consequently, for the private investor to obtain as high a price as possible, he needs to find and negotiate with several potential buyers. This is known to the private investor when he enters into the PPP contract and, as a consequence, he will require a premium upfront to cover the transaction costs should he decide to sell the investment. This premium is referred to as an illiquidity premium.

The private investor could potentially look to sell the equity and/or the debt of the SPV, and the illiquidity premium is applicable to both instruments.

Substantial research has been done on the cause and size of the illiquidity premium. Most research has been done on listed assets, comparing frequently traded assets to less frequently traded assets, and has found illiquidity premium as a function of the bid/ask spread, the financial health of the underlying asset and type of asset (government vs. non-government). While the cause and size of the illiquidity premium on different assets has been debated substantially, the presence of the premium is widely acknowledged.[27] In a seminal paper from 1991, Amihud and Mendelson[28] find that differences in the liquidity of otherwise identical investments (notes and bills with less than six months' maturity) amount to an annual return of 0.4% and are based in the different transaction costs of notes and bills. Other research on long-term US investment grade bonds revealed a liquidity premium of 0.6% while speculative-grade bonds had a liquidity premium of 1.5%.[29]

The illiquidity premium for Danish PPP contracts is estimated by the Danish pension funds to be in the range of 0.5% points and 1.5% points. If neither the private partner nor the public procurer carries any risk, the illiquidity premium will be the only difference between the public and private cost of finance.

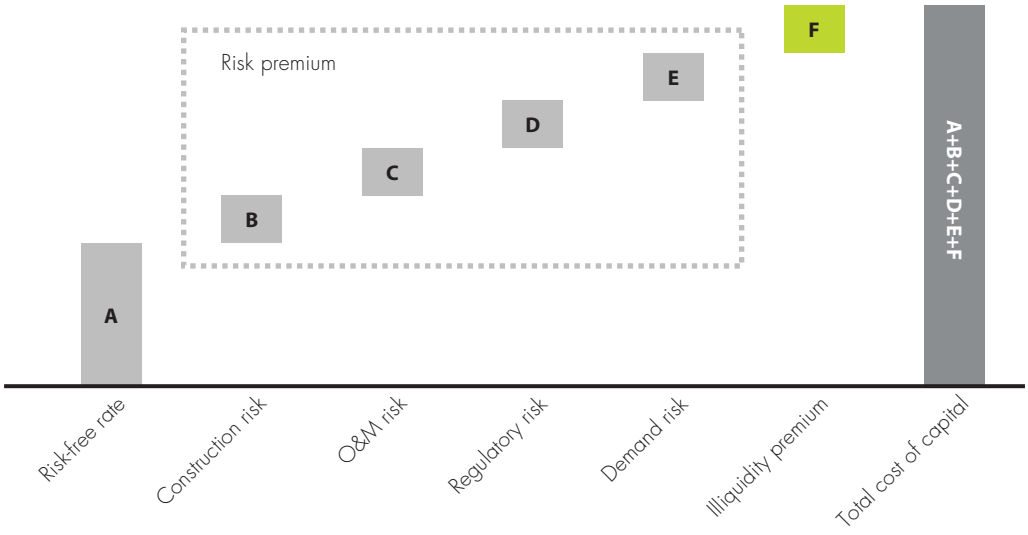
The illiquidity premium is applied in cases similar to PPP. PensionDanmark and PFA have offered finance to Danish export companies backed by Eksportkreditfonden ("EKF") to the effect that EKF has guaranteed the capital (i.e. the pension funds will not lose their capital).

8.3.2 THE RISK PREMIUM

The risk premium is the market price for transferring the risk to the private partner. The project-specific risk premium will be a function of the risk transferred, e.g. the availability risk may be cheaper to transfer than the demand risk of a road tunnel. If the public

procurer decides to retain the risk, i.e. to use public finance, the risk premium will rest with the public procurer. The transfer of the risk implies pricing of the risk, i.e. the risk premium. If the risk retained by the public procurer in a traditional organizational model materializes, it is likely to materialize as cost and time overruns, as discussed in chapter 3. In PPPs, the risk is capitalized and included in the cost of the project.

Figure 19: **Example of the composition of cost of capital**



It could be argued that the risk premium is a form of insurance against cost and time overruns. To clarify this point, an example of how higher finance costs translate into an insurance against cost overruns in the construction phase is shown below.

It is assumed that TIP and PPP can fund a given infrastructure at 3% and 6%, respectively. Further, the total project life is 25 years (1 year construction, 24 years operation) and the unitary charge is fixed at DKK 7.97 per year. Both projects have an NPV of DKK 0 when the cost of construction is DKK 135 in the TIP model and DKK 100 in the PPP model. See Figure 20: Inputs for insurance premium calculation20.

Consequently, in this stylized example, a PPP will be more expensive until the point where the TIP has incurred cost overruns of 35%. If the realized cost of the construction exceeds DKK 135, a PPP would have been a cheaper option.

Figure 20: **Input for insurance premium calculation**

	TIP	PPP
Cost of finance	3%	6%
Project lifetime	25 years	25 years
Unitary charge	DKK 7.97	DKK 7.97
Construction cost	DKK 134,94	DKK 100,00
NPV	DKK –	DKK –

8.4 HYBRID FINANCING

Private and public financing can be combined in a hybrid financing structure. This means that part of the capital structure will be provided by the government.

Hybrid financing is relevant in projects where some form of public involvement/ownership is preferred for political reasons or where the project is too big to be undertaken by either the public or the private partner alone.

Hybrid financing shares many of the positive elements of the private financing structure, including aligning the incentives of the participants in the consortium and quantifying and qualifying the risks for the private partner. It will, however, be harder for the government to achieve an efficient risk/return profile, as there is little incentive for the public procurer to undertake a rigorous identification of risks incurred when providing the low-risk capital. In a normal PPP setup the private business cases are put under scrutiny by several different players, one of the most important being the providers of the debt capital. The lender is the independent reviewer of the proposed business case and is mostly concerned with the potential downside risk. A proper lender will thus challenge the consortium on the aspects of the business case which may seem risky or unrealistic.

8.5 EXAMPLE OF RISK DECOMPOSITION

In Denmark, it has often been mentioned that PPP projects are too expensive relative to the traditional organizational models. The purpose of this section is – as simple as possible – to illustrate the relationship between the cost of finance of the two important organizational models: the state-owned enterprise and the PPP.

For the sake of illustration, below is a thought experiment that the pension funds take over A/S Storebælt. How high a return can the pension funds expect to obtain?

Scenario 1
The pension funds are given the same conditions as Sund & Bælt

In this scenario, the pension funds take over the Great Belt Bridge on the conditions that currently apply to Sund & Bælt. This involves:

- Financing is obtained for 5-7 years at a time and the remaining debt is subsequently refinanced at a new market rate
- The repayment period is flexible, so the asset is not returned to the government until the debt has been repaid

Viewed from the perspective of the pension funds, this will equal an investment in medium-term government bonds. The risks are very limited as any deviation in operating profit is translated into a longer repayment period.

Under this scenario, the pension funds will most likely take over the financing and operation of A/S Storebælt at the interest rate currently paid by the government in the

market plus an "illiquidity premium". Assuming a risk-free 5-year interest rate of 0.5% and an illiquidity premium of 1%, this will total 1.5%. See Fact box 3 for a description of the illiquidity premium.

Why is the return requirement not 5-10%? Because the pension funds – like A/S Storebælt – can convert the risks associated with traffic volume, maintenance, tolls, etc. to a longer repayment period.

Scenario 2
The pension funds are given the same conditions as Sund & Bælt, but a financing period of 30 years

Basically, the pension funds can hedge their pension obligations by long-term investments. It would therefore be obvious to choose a 20-30-year financing period rather than a 5-7-year period. Such a solution would imply that the pension funds obtained a stable and predictable cash flow for 20-30 years, and A/S Storebælt – backed by a government guarantee – would not have to obtain funding in the market at 5-7-year intervals. This reduces the risk as nobody knows the level of interests rates in 5 years' time for certain. Denmark has an AAA rating. Nobody knows for certain whether Denmark still has an AAA rating and, hence, the current favorable borrowing conditions in five years' time.

The government is under an obligation to pay the pension funds an interest rate that covers the 20-30-year risk-free interest rate plus the illiquidity premium. Assuming a risk-free 30-year interest rate of 2% and an illiquidity premium of 1%, this will total 3%. If the debt of the asset has not been repaid after 30 years, the pension funds will refinance the debt, and the asset is not transferred to the government until the debt has been fully repaid.

As in Scenario 1 above, the return requirement will not be 5-10% because the pension funds can convert the risks associated with traffic volume, maintenance, tolls, etc. to a longer repayment period. Basically, the return requirement will be the interest rate on 20-30-year government bonds plus the illiquidity premium.

The conclusions are identical to those under scenario 1, but with 30-year financing.

Scenario 3
The pension funds take over part of the risks assumed by A/S Storbælt

If the government wants a 30-year concession period, i.e. the pension funds do not obtain the favorable flexible repayment period, and the pension funds assume the project risks, then the private partner will, logically, require a higher return for the increased risk. The biggest risk is associated with lower-than-expected traffic volume.

The pension funds will have to inject equity in the company as a buffer against this risk. If traffic volumes do not develop as planned, there must be funds to cover for the lack of revenue. The return on equity – money that can in fact be lost – will typically be 10-15%, depending on the risk assessment.

Under this scenario, the pension funds' return requirement will be higher as illustrated by the calculation below:

- Capital structure and return requirements could be:
  - 30% equity with a return requirement of e.g. 12%
  - 70% loan capital with a return requirement equal to the 30-year government yield plus an illiquidity premium – a total of 3%
- All in all, a return requirement of 5.7%.

Discussion of scenarios

Under Scenario 3, the government/taxpayers pay a higher return and this fuels the public debate: why pay 5.7 % rather than 2-3%?

The rationale for the public sector is that under Scenario 3 the government/taxpayers transfer part of the risks currently assumed by A/S Storebælt to the pension funds as the flexible repayment period is replaced by a fixed 30-year period. Put differently: *Plans have not been made for an unknown series of payment after 30 years from now for future taxpayers and road users. The asset will then be "free" and the government can decide whether to maintain or abolish any tolls.*

The crucial point is not whether the project is organized as a PPP project or a state-owned enterprise. The question is who carries the risks and, not least, how the risks are absorbed. Should it be via the equity or a flexible repayment period?

As noted above, this section should not be taken as a suggestion that the pension funds should take over the Great Belt Bridge but is merely meant to illustrate that the cost of finance "only" differs by about 1%. It is recommended that the future debate about whether infrastructure projects should be organized as state-owned enterprises or as PPPs should focus on the risks assumed by each of the parties.

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9 EXPERIENCES WITH THE USE OF THE PPP MODEL

9.1 SUMMARY

The use of the PPP model was initially concentrated in the Anglo-Saxon countries with the UK leading the way. However, other countries have followed suit and the use of the PPP model is now widespread.

The rationale for using the PPP model has differed from country to country. For some countries it has been a way to finance infrastructure projects in cases where the public sector did not have sufficient funds itself. For other countries, the rationale has been to obtain greater certainty of the projects' life cycle cost and/or maximize value for money.

It is generally acknowledged that the PPP model significantly increases the timeliness and the ability to remain within the budget in the construction of an infrastructure asset. However, the extent to which value for money is maximized is still under scrutiny. Current research and practice developed in the UK focuses on where, when and how the PPP model should be employed in order to maximize value for money.

In Denmark, the experience with PPP projects is limited but so far quite positive.

9.2 WORLDWIDE USE OF THE PPP MODEL

Since the early 1990s and more so since the early 2000s there has been a significant increase in the use of PPPs in various OECD countries. Countries such as Australia, France, Germany, Korea and the UK increasingly use PPPs to deliver services that they previously delivered through traditional public procurement. The rationale for using PPPs is increasingly premised on the pursuit of value for money.[30]

PPP activity in the OECD area reached a peak during the period 2003-2007, before slowing down due to the onset of the international financial crisis and recession.[31]

Today PPP projects are ongoing in France, Spain, Portugal, Germany, the Netherlands, Sweden, Denmark, Canada, Australia, and South Africa. Projects are in development in the USA, Eastern Europe, Turkey, and South East Asia.[32]

The financial recession has not meant the collapse of the European market for PPPs and there is currently strong support for public and private sector collaboration from the highest level of the European Commission. However, since 2008 the huge upheaval in the financial world has meant that the use of PPPs has declined, but it has by no means collapsed. In 2011, the value of PPP transactions reaching financial close in the European market totaled EUR 17.9 billion, which is less than the approximately EUR 24 billion in 2008,[33] but still indicative of significant activity.

Bank financing/liquidity for PPP projects still remains constrained, as loan margins and loan tenors are given on less attractive conditions than prior to 2008/09. Overall, the liquidity shortage in the market has in recent years meant that deals have been competing across Europe for funding.

In addition to this, pressure has been exerted on the pipeline for PPP deals across Europe by the requirement for governments to curb spending in order to reduce budget deficits and borrowing, which has resulted in delays to a number of high-profile PPP projects.

9.3 UK EXPERIENCES

9.3.1 THE PRIVATE FINANCE INITIATIVE

With the start of the Private Finance Initiative (PFI) (in the UK PPP is commonly known as PFI) in 1992, the UK became one of the pioneers in the development of the PPP concept and has to date been the most frequent user of PPP projects on a large scale across the economy.

For most of the last decade, PPPs in the UK constituted approximately 12% of total annual capital expenditure.

The PFI has led to more than 700 PPP projects with a capital value of over GBP 50 billion, see Figure 21.[34]

Figure 21: **Overview of PPP projects**

Portfolio of current PFI projects across Government Department	Number of projects	Total capital costs £ million
Department of Health	118	11,614
Ministry of Defence	46	9,132
Department for Education	166	7,731
Department for Transport	62	7,349
Scottish Government	85	5,693
Department for Environment, Food and Rural Affairs	28	3,844
Department for Communities and Local Government	64	2,241
Northern Ireland Executive	39	2,000
Department for Work and Pensions	4	1,086
HM Revenue and Customs	8	862
Home Office	25	851
Ministry of Justice	23	799
Welsh Assembly	24	543
Department for Culture, Media and Sport	17	349
GCHQ	1	331
HM Treasury	1	141
Foreign and Commonwealth Office	2	91
Department for Business, Innovation and Skills	1	22
Crown Prosecution Service	1	18
Cabinet Office	1	12
Department for Energy and Climate Change	1	4
Total	717	54,712

[1] http://www.hm-treasury.gov.uk/infrastructure_data_pfi.htm

This includes almost 100 hospital schemes, over 100 education projects covering more than 800 schools, about 40 transportation projects and over 300 other operational projects in sectors such as defense, leisure, culture, housing and waste.[35]

Since 2008, the flow of new PPP projects has slowed to a trickle in the face of the weakening UK economy and the disruption in world financial markets. In current markets, PPP projects are more expensive to finance than prior to the credit crisis due to cost of capital for banks, the requirements of Basel III, and the demise of the monoclines which closed the bond markets to PPP projects.[36]

The UK government has indicated that going forward there will be more focus on investing in energy, broadband and transport rather than in social and service infrastructure (hospitals, schools and prisons). Further, as part of its deficit-cutting program, particularly in relation to reducing public sector spending, work is underway to see where savings can be made on PPP projects.[37]

As part of the PFI, the regulative framework for PPP projects in the UK has been well-established, and standardized contracts, guidance notes, policy guidance, statistics, various publications, etc. are available together with various types of support for local and central authorities pursuing the PPP route.

Some key actors in this respect are:

- HM Treasury which holds the responsibility for setting PPP policies in England.[38]
- Cabinet Office Efficiency and Reform Group, whose objectives are to reform the way the government works and to support the transformation of government services by both driving cost savings and focusing on growth to build a platform to enhance public services.
- Local Partnerships, which provide commercial expertise to public sector authorities on delivering cost effective public services and assets. Local Partnerships are a 50-50 joint venture between the Local Government Association and HM Treasury and provide a single source of commercial expertise and know-how for all local public bodies, including local authorities, health and social care agencies, police and fire authorities.

9.3.2 EXPERIENCES FROM PFI AND LAUNCH OF PF2

Over the past 15-20 years, the PFI has enabled many new public buildings and services to be delivered, some of which might not otherwise have been commissioned without HM Treasury championing the PFI as a means of renewing infrastructure in an era when capital constraints meant public finance was not freely available.[39]

There is significant evidence that the objective and purpose of the PFI has in part been met, if point of departure is taken in an assessment of the PFI done by HM Treasury. It indicates that the PFI has offered benefits, such as exploitation of the private sector's project management skills, innovation and risk management expertise. This, in turn, has helped to ensure that buildings are delivered to a high quality, on time and budget and that asset are maintained to a high standard throughout their lives.[40] Further, an average of 80% of PPP projects were delivered on time and on budget compared to an average

of 30% for publicly procured projects.[41]

However, the experiences have also shown that a number of aspects of the PPP model have not worked as intended, which has led to sub-optimal value for money in some projects. Evaluations from the NAO on PFIs have highlighted that the UK government (i.e. HM Treasury) needs to act as a more intelligent customer in the procurement and management of projects because the PPP model has resulted in a slow and expensive procurement process, insufficiently flexible contracts, a lack of transparency of the future liabilities and the perception that some equity investors have made windfall gains. The UK government has already taken a number of steps to address the concerns with the PPP model and to reflect the recent changes in the economic landscape.[42]

In 2011 the UK government initiated a review of PFIs, which was in part prompted by the uncertainty and new regulation in the financing markets as this have made the use of private finance through banks more expensive. The NAO, for example, concluded that, in the current climate, the use of private finance might not be as suitable for as many projects as it has been in the past.[43]

According to the NAO, the case for using private finance in public procurement needs to be challenged more given that the cost of debt finance has increased since the credit crisis by 20% to 33%.[44] Hence, the PPP model will only provide value for money if this increase in the cost of finance is in fact outweighed by savings and efficiencies realized during the life of a PPP project.[45]

The UK government concluded its review in December 2012, at which time it came forth with a new approach, Private Finance 2 (PF2). This continues to draw on private finance and expertise in the delivery of public infrastructure and services whilst addressing past concerns with the PPP model and responding to the recent changes in the economic context. The economic case for PPP projects is thus increasingly resting on the ability to achieve better value for money than conventional procurement through cost savings in the construction and operation of the project; or through the delivery of a qualitatively superior project.

9.3.3 UK PENSION FUNDS IN FUTURE INFRASTRUCTURE PROJECTS

Britain has an infrastructure deficit requiring at least GBP 434 billion of new investment by 2020. In the National Infrastructure Plan (NIP), published on 25 October 2010, the newly formed government committed itself to spend GBP 200 billion on infrastructure in the next five years.[46]

The UK government has encouraged continued private financing for its future infrastructure projects and has directly asked the UK pension funds to provide financing. Following this request, the National Association of Pension Funds (NAPF) and Pension Protection Fund (PPF) signed a memorandum of understanding to create the Pension Investment Platform (PIP) in 2011. Seven of the largest UK pension funds have now signed up to the PIP, which is expected to launch in the first half of 2013.[47]

The PF2 projects are attractive for the pension funds because the projects provide the pension funds with long-term and stable cash flows that match their liabilities.

9.4 DANISH EXPERIENCES

So far the number of PPP infrastructure projects in Denmark has been limited and, consequently, available documentation of project performance is scarce. The Danish Competition and Consumer Authority and PWC conducted a study in 2012 among public authorities involved in PPP projects. The study included 13 Danish PPP projects of which nine were initiated within the last three years. The study only covered preliminary experiences, as many of the PPP contracts have a duration of 15 to 25 years or more. The main findings were as follows:

- In 13 projects, the public procurer found that carrying out the project as a PPP contributed to a focus on optimization of the total cost of the project.
- In 9 projects, the public procurer found that carrying out the project as a PPP contributed to receiving one or more innovative solutions found in the project propositions.
- In 12 projects, the construction had been finished or was well underway so that an evaluation of the quality was possible. In 9 of these 12 projects, the public procurer found the quality of the PPP buildings higher than in traditional building projects. In the rest of the projects, the quality was found to be equal to the quality of other building projects.
- In 7 projects, the public procurer found that the private partner had complied with functional and service requirements as defined in the contract.
- In 5 projects, the public procurer assessed that choosing the PPP model to a large or very large extent ensured compliance with the requirements of operation and maintenance.
- In 12 out of 12 projects in process, the cooperation between the public procurer and the private partner had been positive.
- The public procurers had managed to transfer risks to the private partner, e.g. responsibility for meeting deadlines and budget, compliance with functional and service requirements in operation, risks of operation and maintenance and weather-related risks in the construction period. Even some of the risks usually not transferred to the private partner had been transferred in some projects, including use of utilities (water, electricity and heating in operating the building), and pollution and other site circumstances.
- Initiating a PPP project had required more resources in the tender process than a traditional project (13 out of 13), because the private partners were more involved in project scoping and designing than in a traditional project, where the relation between the public procurer and the private partner is separated by the contract. Further, the design and scope is often done with a time horizon of 15-25 years, whereas traditional contracts often have a much shorter horizon.[48]

9.4.1 POSSIBLE REASONS FOR THE LIMITED USE OF THE PPP MODEL TO DATE

Compared to countries such as the UK, Ireland, Australia and the Netherlands, Denmark has been hesitant towards the PPP concept and some key reasons for this could be as follows:

First, being a Scandinavian welfare state, Denmark has historically been inclined towards public service delivery rather than private sector production of welfare services.

Second, contrary to many other countries, Denmark has not established a central PPP department under the auspices of the Ministry of Finance but under the Ministry for Economic Affairs with a primary focus on social infrastructure, and not transportation infrastructure, which has not received dedicated institutional support from the Danish authorities.

Third, PPP departments have not been established in sector departments.

Fourth, the restrictions on the Danish municipalities in respect to access to private lending and leasing, which made the use of the PPP model less attractive than traditional procurement models, were only amended in 2008, when an inter-departmental group gave PPPs and traditional procurement projects equal regulatory treatment in local government budgets.[49]

Fifth, there is no general set of rules for the tax and VAT treatment of PPP projects, which creates insecurity in the PPP market for projects with certain characteristics.

Sixth, there may be a lack of in-house competencies for the planning and implementation of PPP projects in the relatively small-sized central government and municipalities. Competency-building takes time and perhaps, as the recent increased interest in PPPs in Denmark may suggest, public authorities today are better equipped to deal with PPPs than in the early days of PPPs. Further, relevant financial, technical, legal as well as organizational competencies are available in the private sector due to the experience from Danish PPP projects already implemented.

9.4.2 STANDARD TERMS IN PPP PROJECTS

Recently, a PPP standard contract with a list of appendices has been prepared by the Danish Competition and Consumer Authority. The standard contract reflects the main terms which have governed most of the contracts in Danish PPP projects. The standard contract is supported by a guidance which also comprises guidance on organizing and carrying out the procurement process involved in a PPP project.

The PPP contract governs the general terms of the PPP project and lays down the PPP provider's obligations in the building and construction phase and the operating stage, respectively, on the basis of the performance requirements.

The contents of the standard contract are as follows:

- General regulation of the partners' partnership
- Terms governing the building and construction phase
- Terms governing the operating stage
- The termination situation, whether as a result of expiry or breach

The PPP contract also sets out the terms governing pricing, payment and provision of security. Finally, the PPP contract contains provisions on and thus addresses the flexibility which is necessary in all PPP contracts as a result of the duration of the contract.

The PPP contract is supported by a number of standard provisions which more specifically govern the following factors:

- Function-based requirements
- Payment mechanism
- Requirements for the regulation of the partnership and monitoring of the PPP provider's obligation to satisfy the performance requirements (rules of procedure of the partnership)
- The direct agreement between the public procurer, the PPP provider and the PPP provider's financial partners which secures the right of the financial partners to intervene in a situation where the PPP provider disregards the performance requirements, for the purpose of preventing material breach of the PPP contract.

Courthouse in Holbæk

10 USE OF DANISH PENSION FUNDS FOR DANISH INFRASTRUCTURE INVESTMENTS

10.1 SUMMARY

Investments in infrastructure, characterized by predictable, stable long-term cash flows, match the pension funds' needs well.

The Danish pension system is still accumulating funds as the reforms of the late 1980s and early 1990s take full effect. In consequence, Danish pension funds are investing significant amounts in assets in Denmark and abroad – Danish infrastructure could be included in those assets.

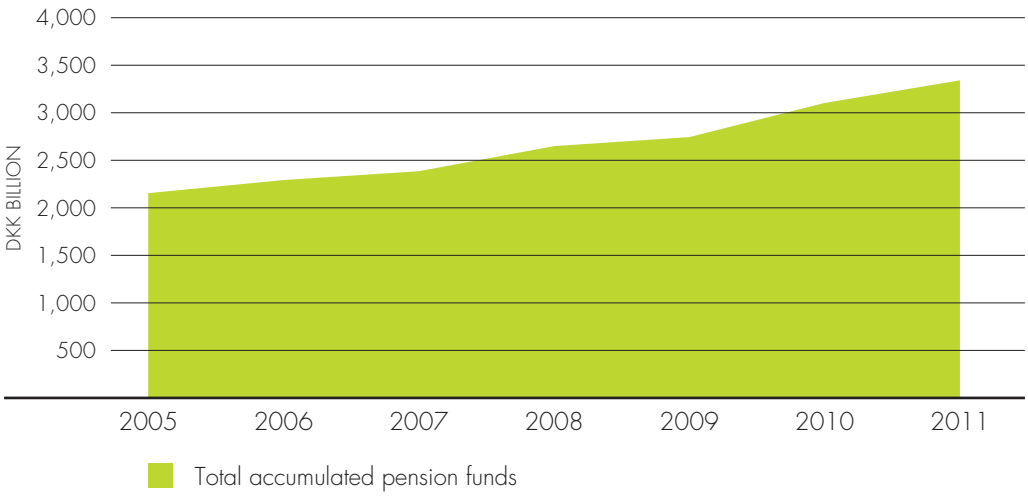
10.2 USE OF DANISH PENSION FUNDS FOR DANISH INFRASTRUCTURE INVESTMENTS

The private equity and debt finance required for Danish PPP projects may come from a number of different sources. One possible source is the Danish pension funds due to the following reasons:

- The Danish pension funds have abundant funds available for investment
- The Danish pension funds have the flexibility to provide either equity or debt to a PPP project
- The investment horizon for pension funds matches the duration of typical PPP contracts
- Solvency II does not prevent pension funds to the same extent as Basel III prevents banks from investing in infrastructure assets

The Danish pension system is developing from being a tax-based system to becoming a more savings-based system, which increases the size of the pension system. In 1984, an average of 4% of a salary was paid to a pension fund, while that figure had increased to almost 11% in 2010. At the same time, disbursements have increased from 15% of total pension disbursements in 1984 to 35% in 2010. This figure is estimated to increase to 50% at maturity.[50] The total funds held by pension funds have increased at an annual rate of almost 8% from 2005 to 2011, ending at a total asset value of DKK 3,341 billion. This is comparable to the size of the Norwegian government petroleum fund. The development in pension fund investments is illustrated in Figure 22.

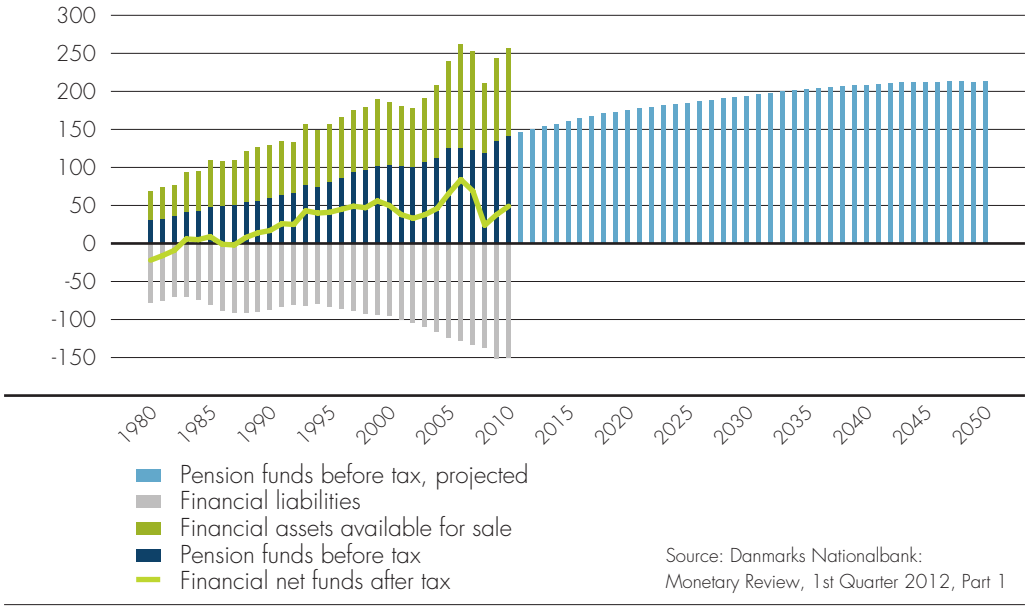
Figure 22: **Danish pension fund investments**



Source: Forsikring og pension: "Pensionsformuens placering i aktiver"

The total asset value of Danish pensions is estimated to increase in percent of GDP from 142% in 2010 to about 200% in 2033 and further to 215% in 2050 as depicted in Figure 23.

Figure 23: **Household net financial wealth and projection of pension wealth in percent of GDP**



Source: Danmarks Nationalbank: Monetary Review, 1st Quarter 2012, Part 1

As a consequence of the significant increase in pension savings, Danish pension funds will be demanding assets on a broad scale for investment. This goes further than listed assets such as stocks and bonds and also includes infrastructure and other alternative assets.

The Danish pension funds have already allocated sizeable capital to infrastructure investments globally, see Figure 24. ATP, PensionDanmark, PKA, PFA and SamPension have invested approximately DKK 37.5 billion in global infrastructure funds. The appealing characteristics of the infrastructure investments are available regardless of whether the project is organized as a PPP or not, and the invested capital demonstrates the pension funds' interest in and commitment to investment in infrastructure. These funds provide both equity and debt finance.

Figure 24: **Infrastructure investments of selected pension funds**

Pension fund	DKKm
ATP	15,124
PensionDanmark	13,740
PKA	5,160
PFA	2,183
SamPension	251
Total	**36,458**

The Danish National
Archives

11

THE USE OF PPPS FOR EXTENSIVE ENERGY EFFICIENCY RENOVATIONS

By Copenhagen Economics

11.1 SUMMARY

Extensive energy efficiency renovation projects are typically combined with other building renovations and/or modernization to obtain efficiencies of scale. The municipalities can fund the energy efficiency renovation via borrowing. The remaining building renovation cost cannot be funded through borrowing unless deposits are made. Thus many attractive energy efficiency projects are foregone.

A local government infrastructure facility that waives the requirement to deposit funds can overcome this barrier. In this context the PPP model is advantageous because the PPP model can be structured to keep net cash flows positive or at least neutral for the local government.

11.2 BACKLOG FOR MUNICIPAL BUILDINGS

In recent years, the municipalities have built up a considerable backlog – recent estimates suggest that a total backlog of DKK 25.6 billion – in building renovation, see Table 2. The backlog is defined as postponed investments which increase long-term user costs associated with the use of the buildings. The total municipal construction budget for 2013 is DKK 15.5 billion, implying that the backlog in the near future will increase further if no exterior funds are brought in to finance further construction.

Table 2: **Backlog municipal buildings, DKKbn**

		Total investment and renovation backlog (in percent of total)		Of which energy efficiency renovation
Schools		10.1	(40)	5.6
	Administrative buildings	2.5	(10)	1.4
	Institutions	2.0	(8)	1.1
	Sports fields	1.8	(7)	1.0
	Nursing homes	1.8	(7)	1.0
	Cultural houses	1.0	(4)	0.5
	Other	6.3	(25)	3.5
	Total	**25.6**		**14.1**

Note: Copenhagen Economics' own calculations
Source: FRI (2012), COWI (2008), Ramboll (2012)

Thus, from a yield and cost-minimizing perspective, gains can be obtained if partial funds can be released for renovation investments now.

11.3 BENEFITS ARISING FROM INVESTMENTS IN BUILDING RENOVATION

The backlog related to energy efficiency renovations amounts to DKK 14.1 billion or 55% of the total backlog. Postponing the implementation of the projects can increase the required investment by as much as 30%.[51] To obtain efficiencies of scale when conducting energy efficiency renovations, the projects are performed in combination with other building renovations and/or modernization.[52] "Lånebekendtgørelsen" (Danish executive order on loans) allows municipalities to fund energy efficiency renovations via borrowing. However, since the remaining building renovation cost cannot be financed via borrowing without making deposits, energy efficiency renovation investments are foregone since their profitability is contingent on being conducted as part of a total solution.

Enhancing energy efficiency induces a number of different effects:

- *Net public budget savings*. The purpose of conducting energy efficiency renovations is to obtain future energy and financial savings. A recent Danish study presented one example of energy efficiency renovations worth DKK 640 per m^2 which delivered an average decrease in annual energy costs of 18.2%.[53] Part of the savings is less taxes paid and thus not a net saving to the public sector. However, as taxes levied on district heating[54] is only 18%, it follows that for each DKK 1.00 saved due to energy efficiency renovations, DKK 0.82 is saved on public budgets. Hence, controlling for the fact that savings obtained through the initial investment cost accumulate annually over a fixed period, this implies that if the allocated investment cost per saved DKK 1.00 is less than DKK 0.82, public budgets will indeed be improved.
- *Increased productivity and health benefits*. Consumption of power and district heating gives rise to air pollution[55] and consequently health problems, which negatively affect productivity. Thus, energy savings should lead to increased productivity and health benefits.
- *Decreased CO_2 emissions*. By implementing energy efficiency renovations, the consumption of energy is reduced and thereby CO_2 emissions.
- *Increased economic activity.* Initiating public building renovations, including energy efficiency renovations, will boost short-run demand and hence increase economic activity. This ultimately increases workers' income, and hence their consumption, and a multiplier effect is initiated – boosting economic activity and employment. This effect is positive in the current economic climate with substantial spare capacity in the economy.

11.4 LOCAL GOVERNMENT INFRASTRUCTURE FACILITY

As described in chapter 2, the central government's framework for controlling local government investment and spending implies that local governments postpone productive investments. To overcome this barrier, a local government infrastructure facility (LGIF) may be employed with the following key characteristics:

- **Allocation to be based on competition.** The local government and the partners its chooses to bring in should produce a business case to be examined by the central government. For the projects that score highest on the well-defined eligibility

criteria, the requirement to deposit funds will be waived. Thus, the facility is not a central government loan facility, it is a facility that allows good investment projects financed by the private market to go forward without or with limited depositing upfront. The size of the facility should be based on financing needs, in particular in municipalities with weak liquidity and a substantial need for investment.

- **Eligibility criteria.** Given the budgetary constraints of local governments over the coming decades, it is crucial that these projects demonstrate ex ante a very strong probability of delivering net savings as well as high public benefits in a life cycle perspective. Ensuring cost savings and positive public benefits over a sustained period of time – possibly decades ahead – requires that the project plan includes a strong risk management part. That is, local governments must ensure that risks are allocated to the right partners from the project inception to the end of the project's lifetime. In particular, measures must be put in place to ensure that local governments are not simply passing bills on to future generations of tax payers.

The qualification process could possibly run through a two-step process:

- At first, potential applications could provide overview proposals that contain the main elements without necessarily presenting fully fledged project appraisals as regards applicability with eligibility criteria and risk management tools. The purpose is partly to protect local governments from investing heavily in project appraisals that are unlikely to meet the criteria, partly to assist them in improving otherwise promising offers.
- In the second round, fully detailed proposals are presented and then examined and ranked in terms of eligibility. Allocation procedures can be flexible, i.e. partial or full wavering of deposit requirements.

To help this process going forward in a productive and transparent manner, several steps can be taken:

- A public help desk function can be established to help municipalities draw up good project plans.
- An advisory body might be involved in the ranking and evaluation of projects.

Using the PPP model for LGIF projects is thus advantageous for two reasons. First, it can be structured to keep net cash flows either positive or at least neutral for the local government throughout the life of the investments when these investments yield a positive economic return. Second, the PPP can, in particular for smaller municipalities, help deliver projects on time and within the budget as they often have limited internal capacity and experience to run larger investment projects.

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12 EXAMPLES OF POTENTIAL DANISH PPP INFRASTRUCTURE PROJECTS

12.1 SUMMARY

A number of Danish infrastructure projects are currently under consideration for being organized as PPPs. A brief summary of each infrastructure project is provided and the potential benefits and issues of using the PPP model in each case are discussed.

12.2 POTENTIAL FUTURE DANISH INFRASTRUCTURE PROJECTS

Main cases

1 Harbor tunnel
2 Næstved motorway
3 Schools

Transportation

4 Bridges crossing Randers Fjord and Roskilde Fjord
5 Kattegat fixed link
6 Railway tunnel between Copenhagen and Malmö
7 Light rail systems in Copenhagen, Odense, Aarhus and Aalborg
8 Hærvej motorway
9 Rolling stock
10 Third Lillebælt fixed link
11 Third Limfjord fixed link

Utilities

12 Waste sorting plant on Zealand
13 District heating
14 Offshore wind farms
15 Drainage systems

Social & service

16 Public office building at Kalvebod Brygge
17 Parking facility in Frederiksberg
18 Public swimming pool in Frederiksberg

Greenland and the Faroe Islands

19 Supporting infrastructure for mining operations in Greenland
20 Skalafjord tunnel on the Faroe Islands

12.2.1 HARBOR TUNNEL

Based on the agreement on a green transport policy concluded on 29 January 2009, Ramboll has proposed a layout for a harbor tunnel in Copenhagen to the Danish Ministry of Transport. A majority of the Copenhagen City Council has subsequently approved the proposal.

The stakeholder structure of the harbor tunnel is complex. Since the harbor tunnel belongs under the state road network, the government will be a key stakeholder in the project along with users, who will experience improved travel times. Traffic in Copenhagen will be markedly relieved in most areas to the benefit of the citizens of Copenhagen. This will relieve the City of Copenhagen of a multitude of investments in congestion mitigation in the years ahead, just as pollution in downtown Copenhagen will be significantly reduced. Landowners near the entry and exit lanes to the harbor tunnel will experience value increases as a result of the improved passability.

If the construction of a harbor tunnel was organized in the usual manner, with the government paying the construction costs, there would be numerous advantages, free of charge, for the users (travel time), the City of Copenhagen (reduction of road expenditure), the citizens of Copenhagen (improved environment) and the landowners (value increases).

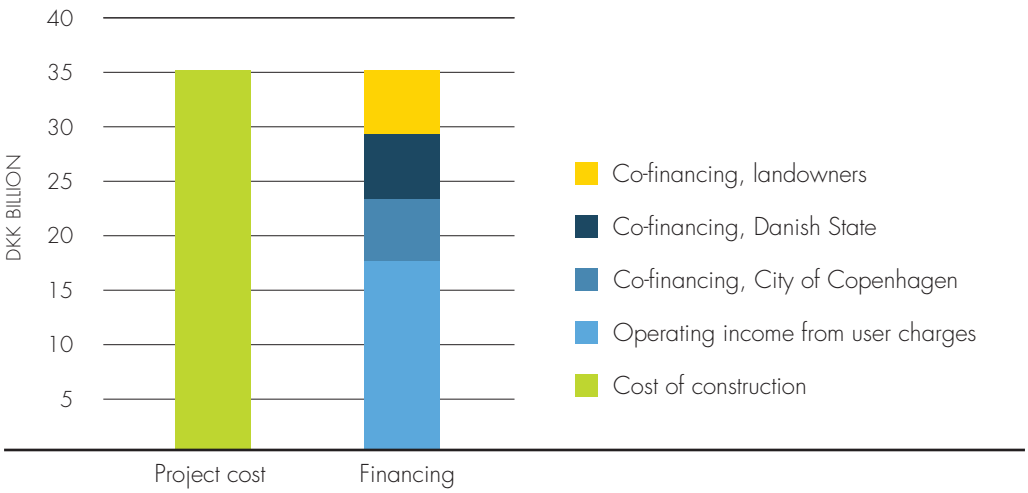
Organizing a harbor tunnel project under the PPP model would allow for an adjustment of the complex stakeholder structure to the effect that those benefiting from the project would be covering some of the financial burden. As a rough outline, the following model is suggested:

- The government finances part of the project because the road is in the nature of a state motorway. The government could, for example, assume part of the risk associated with the underground drilling
- The users pay for using the tunnel
- The City of Copenhagen carries its share of the burden, among others because the City of Copenhagen will be relieved of taking other traffic mitigation initiatives. The contribution of the City of Copenhagen could be to assume the risk of traffic volumes in the tunnel. Traffic volumes will depend, among other factors, on several other decisions to be taken by the City of Copenhagen
- The landowners bear burdens that to some extent offset the future value increases. The major landowners are several pension funds and CPH City & Port Development

The harbor tunnel project could be organized as a PPP with design, planning, construction, operation, maintenance and the ability to settle traffic appropriately being linked together in one long-term contractual relationship corresponding to the concession period. The contractual relationship will provide an incentive to make innovative solutions during the construction and operational phase. At the same time the agreement structure should ensure that the various stakeholders bear burdens corresponding to the advantages gained.

As mentioned, the harbor tunnel is characterized by being a traffic project as well as a city planning project. This dual role should be reflected in the financing structure, for instance as illustrated below.

Figure 25: **Net present value when put into use**



Approximately half of the harbor tunnel could be financed by the users by way of road pricing. The remaining 50% could be distributed equally on the government, the City of Copenhagen and the landowners (various pension funds and CPH City & Harbour Development). See Figure 25.

Another distribution basis is also possible. The essential point here is to strike a reasonable balance between the individual stakeholders' financial burden and the economic advantages of the project.

A PPP requires a competent procurer organization to manage the negotiations and subsequently the contract. Since Sund & Bælt has already gained experience in this area, it would be natural to include Sund & Bælt in the procurer side of the project.

The complex stakeholder structure makes the PPP model particularly suitable as it to a greater extent allows a coordination of stakeholder interests, expenditure and gains.

Organizing the harbor tunnel as a PPP opens up for commercial synergies. These could for example include parking facilities and gas stations. There are well-functioning markets for both activities, which in turn means that there is significant know-how accumulated in the private market. The best way to utilize this private know-how is to have a private operator taking responsibility for the asset. Thus, having the consortia include a gas station operator in the design phase allows the public procurer to obtain a solution based on information not available to them.

12.2.2 NÆSTVED MOTORWAY

In the traffic agreement of 22 October 2009 "Nye initiativer som led i udmøntning af puljer" (New initiatives as part of the utilization of funds) it was agreed to carry out a preliminary study of an upgrade of the Næstved–Rønnede stretch. Subsequently, in the traffic agreement "Bedre mobilitet" (Improved mobility) of 26 November 2010, it was agreed to move the preliminary study forward for completion in 2012.

The preliminary study shows that, in periods, traffic on the existing road is close to capacity and that the line routing is outdated. In many places, the sight conditions make it difficult for road users to overtake other users. Moreover, the road is used by agricultural vehicles which, combined with the traffic intensity, results in reduced passability. Thus, it would be an advantage to change the traffic flow in the stretch to improve both passability and road safety. The preliminary study further concludes that it would be more appropriate to construct a new road link than to expand the existing one due to the location of two urban communities and many properties close to the existing road.

Based on certain traffic volume assumptions, the Næstved–Rønnede stretch has potential for being financed by user charges. Assuming expected construction costs of DKK 1.2 billion, a traffic volume of 17,000 vehicles/day and a concession period of 30 years (after which the government takes over the road from the private consortium free of charge), it is not unrealistic for the project to be commercially viable at user charges in the order of DKK 10-15 per trip.

The risk associated with traffic volumes represents a key challenge to be solved prior to the project being offered as a PPP. Since the new road will be in direct competition with existing highways, demand by users is expected to be very price sensitive. Given the significant influence of the traffic authorities, it is difficult for a private investor to assume this risk. The project appears to be suited as a PPP, if an appropriate solution is found to the traffic volume uncertainty. One option would be to let the public partner carry the entire or the majority of the traffic volume risk, and to make payments to the private partner depend on whether the facility is available to the road users – a so-called availability-based payment.

12.2.3 SCHOOLS

A considerable share of Danish school buildings suffer from a considerable maintenance backlog. Moreover, they are often outdated in an educational context. Combined with a declining birthrate, this often leads to undesirably low class sizes and high derived costs per pupil for buildings and core operations. This has put a number of municipalities in a difficult dilemma, the outcome of which is typically close-downs and mergers of schools. However, merging schools into fewer schools does not make the buildings more suitable or up-to-date in respect of energy economy, area use etc., and the dissatisfaction has sometimes resulted in the set-up of private schools.

It may seem a paradox to set up new schools in a situation with plenty of capacity; however, experience from e.g. the municipalities of Frederikshavn, Gribskov and Langeland show that good planning and using the PPP model can provide significant overall

economic savings on buildings and core operations. By using PPPs, the municipalities knew the capital expenditure and operating economy prior to concluding the contract. New buildings typically have smaller areas and, hence, lower energy, operating and maintenance expenditure. In PPPs, the private partner takes responsibility for the operation, maintenance and energy consumption of the buildings over a contract period of typically 25-30 years; subsequently the buildings are transferred to the municipalities.

The construction of new schools poses a number of generic problems. The potential for repeating/further developing the best ideas and principles behind the new schools and reusing them for other new schools is significant. This can be done profitably by using PPPs, which due to the linkage between lifetime economy, output-based specifications and architectural design are particularly well suited since the private consortium can exist across projects. In this way, the private partner can base its tender on experience gained from similar projects in other municipalities.

Based on Ernst & Young's experience in the development of business cases for municipal school structures, it is estimated that significant savings can be obtained compared to maintaining the existing building structure. The potential depends on the condition of the schools and any other factors that need to be taken into consideration, such as geographical conditions. Thus, the savings potential both comes from the buildings and the possibility to carry out the core service more efficiently.

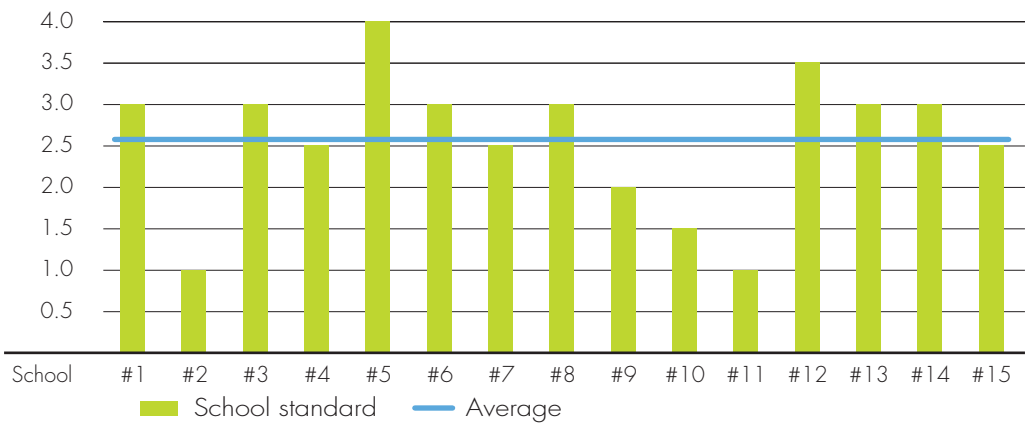
Schools are considered particularly well suited for the PPP model for various reasons. The individual municipality usually builds new schools at very large intervals. By using PPPs, the know-how gained in the private sector can be utilized efficiently, thereby providing the private partner with a direct economic incentive to contribute new and more efficient solutions. The example of the schools also illustrates the economic optimization, because the operating expenses over 25-30 years are very considerable compared to the capital expenditure.

The potential for optimization of the school structure in Denmark is shown by the generic example below.

The calculations are made on the basis of data from a Danish municipality, which on key parameters (geography, demography, income, etc.) is roughly representative of an average municipality in Denmark. As municipalities differ across the country so will the applicability of the case. However, as representative of the average municipality the case will be relevant for a sizeable number of Danish municipalities.

Approximately 5,500 school children attend the 15 municipal schools spread across the municipality. The schools are in varying conditions, as shown in Figure 26, with four schools in significant need of refurbishment. The rating takes into account the degree to which the school building supports the current teaching methods and the degree to which the buildings have been properly maintained.

Figure 26: **School standard, rating 1-4 (4 is best)**



The decision of whether or not to refurbish which schools should be founded on an analysis of the optimal school structure for the municipality, meeting both the needs of current and future generations of school children.

The cost of bringing the schools up to a rating of 3.5+ is listed in Figure 27. It is clear that the cost of refurbishment of each school differs significantly, as there is a large spread in both the size of the schools and the standard.

Figure 27: **School overview and refurbishment cost**

School	Square meters	Estimated cost of refurbishment per square meter, DKK	Estimated cost of refurbishment, DKK
School 1	5,028	4,000	20,112,000
School 2	348	8,000	2,784,000
School 3	2,306	4,000	9,224,000
School 4	3,678	5,000	18,390,000
School 5	10,562	–	–
School 6	2,144	4,000	8,576,000
School 7	6,638	5,000	33,190,000
School 8	1,655	4,000	6,620,000
School 9	3,943	6,000	23,658,000
School 10	1,946	7,000	13,622,000
School 11	5,801	8,000	46,408,000
School 12	8,566	–	–
School 13	6,430	4,000	25,720,000
School 14	2,827	4,000	11,308,000
School 15	3,074	5,000	15,370,000
Total	**64,946**	**3,618**	**234,982,000**

Assumptions

The analysis is based on a list of assumptions. The assumptions have been determined in close corporation with the municipality to ensure the most appropriate input for the business case evaluation.

The analysis is based on a demographic prognosis from 2009, adjusted for pupils attending private schools, and consolidated by the municipality's prognosis for school children. It is assumed that the maximum capacity of a school class is 28 pupils.

Furthermore, it is assumed that the cost of refurbishment of buildings with very large, large and medium maintenance backlog is DKK 8,000, DKK 6,000 and DKK 4,000 per m^2, respectively, while buildings with a small maintenance backlog will not undergo refurbishment. The refurbishment costs are based on the cost of similar works done by the municipality around the time of the analysis.

Furthermore, it is assumed that the construction of lasting buildings will cost DKK 13,000 per m^2, while temporary buildings will cost 9.000 m^2 and manufactured buildings DKK 7,500 m^2.

For the human resources it is assumed that each class needs 1.6 teachers, and that the average annual salary of a teacher is DKK 0.5 million.

An updated school structure leads to increased travel cost for the pupils. It is assumed that school busses have a capacity of 50 pupils, that the frequency will be four tours per day and that one minute of bus transport costs DKK 2,000 per year.

Finally, it is assumed that the O&M of a new building is DKK 350 per m^2/year while the cost of power, water and heating of a BR2015 building is DKK 140 per m^2/year, and that a school class will require approximately 330 m^2 in an optimized building, the equivalent of approximately 12 m^2 per student. The estimated cost structure includes:

- Refurbishment
- O&M of the buildings
- Cleaning
- Utilities
- Staffing – teachers and service staff
- Increased cost of transport for pupils

Results

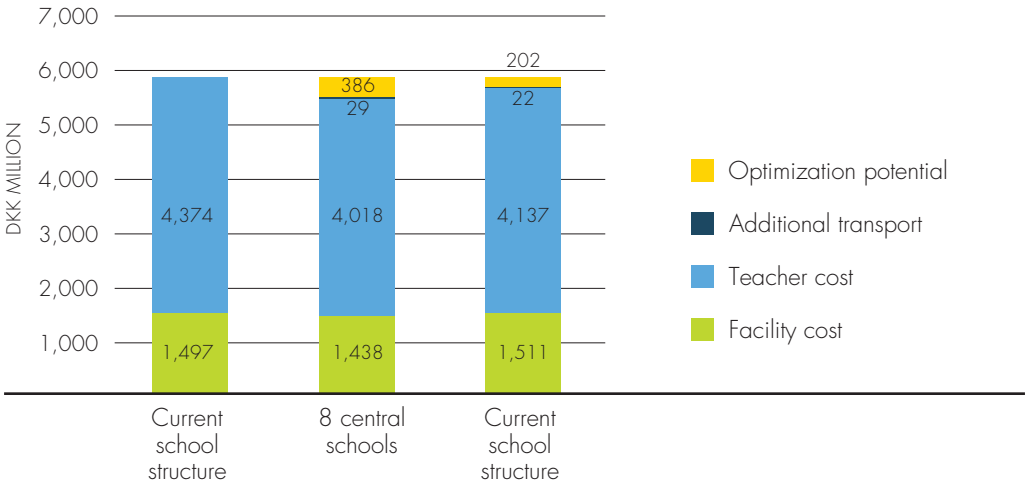
Figure 28 shows three scenarios:

- Scenario 1: Refurbishing the schools but maintaining the current school structure
- Scenario 2: Closing down eight schools, constructing one new school and refurbishing seven schools – in total eight schools
- Scenario 3: Closing down five schools, constructing one new school and refurbishing 10 schools – in total 11 schools

The most advantageous case from a financial point of view is Scenario 2, which leads to savings over the lifetime of the schools of DKK 386 million, or 7% of the total current cost. This scenario has the lowest facility cost and the lowest teacher cost, but also the highest additional transportation cost. See Figure 28.

The analysis shows that the current school structure will be expensive for the municipality due to the relatively poor utilization of the schools and the significant maintenance and refurbishment backlog. The analysis also shows that an updated school structure opens up for better building and resource utilization, which leads to freeing up liquidity for the municipality.

Figure 28: **Scenarios**



The number of pupils per class under the current structure and under the proposed structures is shown in Figure 29. Intuitively, the more schools, the lower the number of pupils per class.

Figure 29: **Average number of pupils per class**

Average pupils per class, 2011	Current structure	8 central schools	8 central schools and 3 prep schools
School 1	22.0	23.7	23.7
School 2	14.3		
School 3	18.4		
School 4	18.0		13.9
School 5	23.5	24.1	24.1
School 6	17.0		15.8
School 7	23.0	21.1	22.4
School 8	19.4		18.3
School 9	18.0	19.5	19.5
School 10	19.3		
School 11	25.0		
School 12	15.9	25.2	23.5
School 13	21.3	22.6	22.6
School 14	20.9	18.3	18.3
School 15	18.0	22.8	21.6
Average	**19.6**	**22.2**	**20.3**

The optimization of the overall economy is driven by several factors. By having fewer but larger schools, the number of pupils per class can be increased, thus utilizing the teacher resources better.

The schools suggested for closing include the schools with the worst standard rating, but the standard of the school alone is secondary to the location of the school. As the school structure is optimized on a 35-year horizon, the cost of bringing a school up to date is minor relative to the possible efficiency gains by having the right number of schools in the right sizes and conditions at the right locations.

12.2.4 BRIDGES CROSSING RANDERS FJORD AND ROSKILDE FJORD

The new fixed links for Roskilde Fjord and Randers Fjord share central characteristics. To avoid repetition, only the new bridge crossing Roskilde Fjord will be discussed below, but the example is applicable to the other fixed link as well.

The Roskilde project consists of a new bridge south of Frederikssund that will provide increased access, less congestion and a shorter travel time for people traveling by the Kronprins Frederiks Bridge across the inlet today.

Sund & Bælt and COWI have estimated the construction cost to be DKK 1.9 billion.

The new fixed links will be in direct competition with existing fixed links, reducing the potential for employing user charges to finance the project. The public procurer will have significant influence on the traffic volume. If constructed as a PPP project, availability-based payment will be necessary.

12.2.5 KATTEGAT FIXED LINK

The current highway network in Denmark only has one connection between east and west, the Great Belt fixed link, making the distance between Central and Northern Jutland on the one side and Zealand on the other long and time-consuming.

Ramboll estimates a construction cost of almost DKK 80 billion and an additional DKK 20 billion for establishing the necessary land-based facilities (Region Midtjylland, 2008).

The first rationale for constructing the fixed link is to reduce the risk associated with only having one fixed link tying Jutland and Zealand together. In the event that this fixed link is unavailable for more than a few days, Danish and Scandinavian logistics will suffer a significant impact.

The second rationale is based on establishing proximity between the two major growth areas in Denmark – Copenhagen and Aarhus and the urban areas around them. By establishing the fixed link between Copenhagen and Aarhus, the travel time between the two centers will be reduced to 1 hour by train, effectively putting the two cities within commuter range and increasing the dynamics of the growth regions further.

The fixed link is unlikely to be fully financed by user charges due to the size of the project.

However, there are other sources of benefits to the Danish society, which should be included in the project calculation. Firstly, if the Kattegat fixed link is not constructed the capacity of the existing road network from Aarhus to Copenhagen will need to be expanded. Secondly, there will be a significant productivity loss associated with the slow-down of traffic during the construction of the new car lanes.

Thus a fixed payment from the Danish government – in addition to the user charges – could be employed to finance the project in a PPP model.

12.2.6 RAILWAY TUNNEL BETWEEN COPENHAGEN AND MALMÖ

In the future, the existing Oresund link is expected to be insufficient to handle the increasing traffic that will result from e.g. the Femern Belt link and high-speed trains between Denmark and Sweden.

The Copenhagen and Malmö municipalities have initiated studies of the cost of a Copenhagen-Malmö metro connection, examining different tunnel solutions. The EU Interreg fund has granted about EUR 1 million for the study.

The vision is to establish a link bringing people from central Copenhagen and central Malmö in just 15 minutes, strengthening the cities in competition with other large cities in Northern Europe and providing a basis for economic growth in both the Malmö and Copenhagen area.

The price of a metro connection between Copenhagen and Malmö has previously been estimated at almost DKK 11 billion.

The municipalities expect to have conducted the necessary studies and collected the necessary information in about two years and aim to be able to initiate the decision-making phase then.

This is a large and complex construction project which could potentially be financed by private funds and partially by user charges. The stakeholder structure is complex because it consists of municipalities in two different countries. Thus, the project is suitable to be considered for the PPP model.

12.2.7 LIGHT RAIL SYSTEMS IN COPENHAGEN, ODENSE, AARHUS AND AALBORG

As an alternative to urban transportation, several major cities are working to implement light rail solutions. The Aarhus light rail project has already been through a prequalification process of possible supplier consortia, in Odense an Environmental Impact Assessment is being prepared to bring the decision process to the next step.

In the suburbs of Copenhagen, a light rail solution is being considered as a means to provide better public transportation in between the lines of the existing S-bane system by improving travel time and in order to mitigate congestion problems on the busy Ring 3 bypass around Copenhagen.

The Ring 3 light rail organization consists of the 13 municipalities that the bypass is running through, the regional authorities and the Danish State – each expected to finance a share of the new transportation system – even if the State is not planning to be an owner.

Currently the system is estimated to require capital expenditure in the order of DKK 5.3 billion with operating costs in the order of DKK 162 million. The revenue from tickets is expected to be in the vicinity of DKK 125-140 million a year once the system is fully operational.

In order to balance the expected revenue against the necessary investments and operational expenses it will be necessary to consider either some level of subsidy or the opportunity to commercially utilize the areas around the platforms.

This project is a large and complex construction project which could potentially be financed by private funds – potentially in combination with a public grant or other type of subsidy – and partially by user charges. The stakeholder structure is complex because it consists of different municipalities. Thus, the project is suitable to be considered for the PPP model.

12.2.8 HÆRVEJ MOTORWAY

The E45 motorway in Eastern Jutland connects Norway and parts of Sweden with Germany and Southern Europe through Jutland. Congestion problems on the motorway are increasing. Possibilities for increasing the capacity of the roads down through Jutland are being studied, both in terms of expanding the E45, but also in terms of establishing new infrastructure to take the pressure off the E45.

Constructing a Hærvej motorway in central Jutland passing through Viborg could remedy the congestion problems. The following scenarios have been examined by Niras on behalf of the Ministry of Transport in 2010:[56]

- Støvring to Kolding: DKK 13-18 billion
- Støvring to Kolding through Billund (West): DKK 13-18 billion
- Hobro (or Støvring) to Haderslev through Silkeborg and Billund: DKK 14-19 billion
- Hobro (or Støvring) to Vejle: DKK 8-12 billion

The Hærvej motorway would be in direct competition with existing roads, reducing the potential for employing user charges to finance the project. The public procurer will have significant influence on the traffic volume. If constructed as a PPP project, availability-based payment will be necessary.

12.2.9 ROLLING STOCK

The Danish government has recently suggested that the rail infrastructure between the major cities of Copenhagen, Odense, Aarhus and Aalborg should be improved to allow for the implementation of the so called 'one hour' model that allows trains to operate with a one hour travel time between each of the major cities.

In order to operate the 'one hour' model – and thereby take advantage of the infrastructure investments – it will be necessary to invest in new electrical train sets.

Putting new trains into operation is a complex process, and experience throughout Europe emphasizes that the acquisition of new trains is at risk of running into substantial delays. Delayed delivery may require alternative capacity to deliver the agreed level of operation. This will represent a substantial economic risk for the train operator.

By organizing the purchase of new trains as a PPP it may be possible to secure focus on output-driven requirements and clear incentives to deliver on time. The payment mechanism may be based on availability (kilometers between service) and usage (kilometers operation) for the lifetime of the asset. No payment to the PPP consortium would take place before the train is running in passenger operation mode. At present, however, it is uncertain if there is a private market to support a PPP model for the acquisition of rolling stock. This needs further examination in light of the proposed legislation on rolling stock taking effect in 2017.

12.2.10 THIRD LILLEBÆLT FIXED LINK

The fixed links between Jutland and Funen consist of a mixed railway and road bridge built in 1935 and a motorway bridge built in 1970. As a result of the political agreement to decrease travel time between Zealand, Funen and Jutland, these links will be ever more central in the future Danish infrastructure.

Four different routings have been examined for a third fixed link between Funen and Jutland.[57] All four routings reduce the availability risk of central Danish infrastructure as the completion of the link will reduce the risk of isolation of either Jutland or Funen. If an accident were to happen with the existing old Lillebælt Bridge, Funen and Zealand (and ultimately Sweden) would be cut off from continental Europe.

The new fixed link will be in direct competition with existing fixed links, reducing the potential for employing user charges to finance the project. The public procurer will have significant influence on the traffic volume. If constructed as a PPP project, availability-based payment will be necessary.

12.2.11 THIRD LIMFJORD FIXED LINK

Traffic passing through Aalborg has increased by approximately 2% p.a. over the last 30 years. The increase has been absorbed by the Limfjorden tunnel. The number of cars passing every day over the bridge has been steady at around 30,000 in this period while vehicles passing through the tunnel have increased from 30,000 to approximately 70,000 over the same period. Going forward, the capacity utilization of the tunnel at peak hours will be between 101% and 117% which has negative consequences for travel time.

Thus, a new connection consisting of a tunnel from Ålborg to Egholm and a bridge crossing Nørredyb to relieve the existing connections have been proposed. The capital investment for this connection is estimated at DKK 4.7 billion excluding regulatory buffers.

It is feasible to set up a road toll system for crossing the Limfjorden, assuming all connections are tied together either directly or through shadow-tolling. This would make this project a suitable candidate for the PPP model.

However, in this case, the local municipality has a significant impact on the viability of the business case post-construction. Consequently, alignment of interest between the government, the local municipality and the private partner is fundamental to the busi-

ness case. For example, an appropriate risk sharing could be that the private partner took over risks associated with availability. While the third fixed link will improve the traffic situation in particularly Aalborg, the whole region will benefit from the improved infrastructure. Consequently, the traffic risk could be shared between the municipalities affected by the tunnel.

12.2.12 WASTE SORTING PLANT ON ZEALAND

There is a need to establish a new waste sorting plant that will serve the most of Zealand.

The construction and operation of this new waste sorting plant would require the involvement of multiple municipalities and other public institutions. The PPP model can be used to manage this complex stakeholder structure.

The new plant will have free capacity that can be commercially exploited by a PPP consortium. A bid from a PPP consortium would implicitly contain a deduction for the expected value of the free capacity. This leads to lower project costs for the waste plant than if public finance was used.

As recycling grows in importance in the coming years, the technology is poised to improve. By placing the technological risk with the private partner and demanding mark-to-market of the output recycling percentages, the private partner is incentivized to maintain and update the processes and technology continuously, leading to a higher recycling percentage for the municipality.

User charges can be employed to finance part of the project, and there is a well-functioning private market for construction and operation of waste sorting plants.

Thus, the waste sorting plant is a good PPP candidate.

12.2.13 DISTRICT HEATING

To make Denmark CO_2 neutral in 2030, DKK 30-40 billion in investments and an additional DKK 35 billion in maintenance are required.

Expanding and maintaining the district heating system provides a significant project base across which lessons learned can be accumulated. Exploiting lessons learned will result in investment cost reductions and shorter construction time.

District heating investments could be financed by private funds that recoup their investment and operating expenses via a combination of user charges, i.e., the customer pays a certain price for the energy that is provided by the private partner, as well as income from the co-generation of electricity that can be sold into the electricity market.

Pension funds could participate in international PPP projects where Danish cleantech companies are involved. In this way Danish suppliers will be able to deliver solutions rather than just components.

Repeatability, user charges and international market potential for the knowledge accumulated in Danish district heating projects makes district heating a good candidate for PPP investments.

12.2.14 OFFSHORE WIND FARMS

Denmark has an ambitious green energy policy. The long-term goal for 2050 is that Denmark should be independent of fossil fuels. The regulatory framework is stable and offshore wind has broad political support.

For 2020, the goal is to have 50% of the Danish electricity consumption accounted for by wind power. Therefore new offshore wind projects in Denmark will be tendered by the Danish government. These projects consist of Horns Reef 3 (400 MW), Kriegers Flak (600 MW) and near-shore wind farms (450 MW).

The winners of the tenders will build and operate the offshore wind farms for a fixed duration. It is expected that their revenues will consists partly of a fixed sum regulated and secured by the Danish government and partly of a variable sum that stems from the variable amount of produced energy that is sold into the electricity market.

The winners will build only the turbines, foundations and inter-array cables whereas Energinet.dk is to build and operate the offshore transformer stations, export cable, as well as all necessary reinforcement onshore. The costs incurred by Energinet.dk for connecting the wind farms will be paid by the electricity consumers directly and they will not be imposed on the owners of the wind farm concessions.

The long-term nature of offshore wind farm projects and the stable cash flow matches the long-term liabilities of the pension funds well which, all else equal, can lead to pension funds accepting a relatively lower return on their investments.

The government provides the incentive to invest into offshore wind farms through a support mechanism. The private partner assumes responsibility for construction, operation and financing.

12.2.15 DRAINAGE SYSTEMS

The adoption of the water action plan in 2011 and future plans are expected to lead to significant investments in the drainage systems in the coming years.[58]

The significant potential for repetition coupled with an availability payment mechanism makes drainage systems good candidates for PPP investments. However, the rule regarding self-containment is a barrier to investments.

12.2.16 PUBLIC OFFICE BUILDING AT KALVEBOD BRYGGE

The Danish Building and Property Agency has announced an upcoming tender process regarding a PPP for an office building on Kalvebod Brygge. The building is expected to save costs by hosting Banedanmark, the Danish Energy Agency, the Danish Transport Authority and the Danish Road Directorate in an energy efficient and modern office building of 41,000 m^2. It is estimated that cost savings will be around DKK 15-20 million per year in rent and operation of the building.

The Danish Building and Property Agency has already completed seven PPPs: Tinglysningsretten (courthouse) in Hobro, Rigsarkivet (the Danish National Archives), a new tax center in Haderslev (office building), and four new courthouses. Bygningsstyrelsen can thus leverage lessons learned – both in the public as well as in the private sector – from these projects in a PPP for Kalvebod Brygge.

On the one hand, the Kalvebod Brygge office building would be a standard asset and could potentially be leased on the private market rather than constructing it as a PPP project. On the other hand, using the PPP model will ensure that the public procurer can leverage learning effects and will have ownership of the building after the PPP contract has expired.

12.2.17 PARKING FACILITY IN FREDERIKSBERG

Many commuters working in Copenhagen park their car in Frederiksberg. This has resulted in a situation where the municipality of Frederiksberg has insufficient parking facilities for its own citizens.

Only very few sites are available for the construction of parking facilities above ground. Therefore, Frederiksberg is looking to establish new underground parking facilities.

Parking facilities can be entirely financed by user charges. There is a liquid and active private market for the construction and operation of parking facilities. A PPP allows the public procurer to tab into the knowledge and expertise of this private market.

Thus new parking facilities in Frederiksberg are good candidates for PPP projects.

12.2.18 PUBLIC SWIMMING POOL IN FREDERIKSBERG

The municipality of Frederiksberg currently only has one indoor swimming pool for its 100,000 citizens, and options are being explored as to where and how to construct and operate a new swimming pool.

There would be significant commercial opportunities available in a swimming pool for a PPP consortium. For example the opening hours of the swimming pool would be divided in two: Municipal hours for schools, elderly etc. and market hours, where the consortium would be free to offer use of the asset to the private market.

Experience shows that private consortia, in addition to utilizing the market potential of

the asset, also establish additional facilities in connection with swimming pools (e.g. gym and spa facilities) to further increase the market potential of the swimming facility.

When private consortia are bidding for a contract, the bid would implicitly contain a deduction for the expected value of the market potential. This leads to a lower project cost of the swimming pool than would otherwise be obtained, as the municipalities are unable to tap into the private market due to legal restrictions.

User charges can be employed to finance part of the project and there is a well-functioning private market for the construction and operation of public swimming pools.

A public swimming pool is thus a good PPP candidate.

12.2.19 SUPPORTING INFRASTRUCTURE FOR MINING OPERATIONS ON GREENLAND

Greenland is facing an era of mining and quarrying. And Greenland will need new roads, harbors, power plants, etc. Greenland will most likely not have the required funds to invest in such an upgrade of the infrastructure.

Some foreign companies have already expressed an interest in establishing infrastructure in order to pave the way for their mining and oil businesses. In this case, the infrastructure will ultimately be privately owned.

Another option is to finance the infrastructure via PPP projects. In this case, the infrastructure ultimately returns to the Greenlandic authority when the PPP contract expires.

12.2.20 SKALAFJORD TUNNEL ON THE FAROE ISLANDS

The Faroese government would like to have a road and tunnel link under the Skálafjord and Tangafjord connecting southern Streymoy with southern Eysturoy. The road and tunnel link would reduce travel time and distance between the three largest cities on the Faroe Islands: Tórshavn, Klaksvik and Runavik. Such new infrastructure would significantly promote mobility and thus be conducive to economic growth and increased cohesion. The construction costs are currently estimated to be DKK 1 billion.

The Faroese government considers using the PPP model for this infrastructure project and potential bidders are currently being prequalified. A simple concession structure is under consideration whereby the winning consortium would be granted the exclusive right to construct and maintain the infrastructure. The PPP consortium would finance and operate the asset. The PPP consortium will recoup its investments completely based on income received from user charges.

The exclusive rights are granted for a variable, but capped to a certain maximum, period of time after which the asset will be taken over by the Faroe Islands. The concession period is variable because the Faroese government is considering having the bidders compete on the return they require which would depend, amongst other things, on realized construction costs, traffic volume and O&M costs.

APPENDICES

A LEGAL TOPICS RELATING TO THE PPP MODEL

A.1 TRANSFER PRICE UPON CONTRACT EXPIRY

According to current Danish tax legislation, the SPV setup for the project should bear the risk of ownership throughout the duration of the PPP contract. This entails that the transfer price should be the market price that exists when the asset is transferred. When there is a market for the PPP asset, a transfer price of the liquid asset cannot be agreed upfront when entering into the PPP contract. When there is no market for the PPP asset, a value for the transfer can be agreed upfront.

Thus, the current tax legislation results in a situation where the market risk must always be borne by the consortium whenever the PPP asset is assessed to be liquid.

This may to a large extent distort the focus of the PPP model as bidders, in addition to focusing on minimizing total capitalized life cycle cost, also need to come up with an estimate of the future transfer price that then becomes a financial element of the bid. The more the expected future transfer price influences the economics of the bid, the more the focus may be driven away from the original purpose of the PPP model.

A.2 TERMINATION AS A RESULT OF EXPIRY

The point of departure is that the PPP contract is non-terminable for both parties during the entire contract period. The PPP contract may be terminated during the contract period only for material breach, see below. As a general rule, termination on expiry of the PPP contract involves a regulation of how the PPP asset is to be handled when the contract expires.

For the purpose of creating transparency for the public procurer as well as the PPP provider, the point of departure is that the purchase price for the transfer of the asset to the public procurer should be laid down in the PPP contract. This will then, as a general rule, be combined with both an option and an obligation on the part of the public procurer to purchase the asset. Such regulation of the termination situation is to the benefit of both parties. The public procurer can then prepare itself to acquire the asset at an already agreed price, and the private partner (the subsequent PPP provider) can submit its tender on the understanding that there is no risk involved in the valuation of the asset when the contract expires.

As a general rule, the output-based specifications will also set out the requirements which apply to the condition of the PPP asset on expiry of the contract. The PPP contract will stipulate the terms for an inspection of the PPP asset for the purpose of ensuring that the performance requirements to (and remaining life of) the PPP asset have been met. If not, the PPP provider will have to either ensure that the requirements are met or accept a set-off in the purchase price equal to the costs of the public procurer in having to bring the PPP asset to the condition agreed under the performance requirements

A.3 SYSTEM FOR RECTIFICATION OF CONTRACTUAL BREACH

If material contractual breach is made by the private partner, the contract should include a system for rectification. This entails that the public procurer should give the private partner a fair opportunity to rectify the breach. The exact system or method should be clearly outlined in the contract minimizing the risk of disputes over whether the public procurer has the right to terminate the contract.

A.4 TERMINATION AS A RESULT OF BREACH

The PPP contract regulates the situation of breach, i.e. breach of the PPP contract on the part of either the PPP provider or the public procurer. This entails that both partners in the PPP are able to leave the PPP, but only under certain circumstances, which must be clearly specified. [59]

The contract must outline under what circumstances the public procurer has the right to terminate the contract due to material breach by the private partner. The definition of material depends on the specific project, but it is important that the contract clearly states that a minor contractual breach does not give the public procurer the right of early contract termination. Only material (intentional or unintentional) breach or actions from the private partner should make contract termination a possibility.

The PPP contract must also outline under what circumstances the private partner can terminate the contract. The main point here is that the private partner must have the right to terminate the contract if the public procurer takes actions that make it impossible for the private partner to deliver the required services to the PPP. Only serious (intentional or unintentional) failures or actions from the public procurer should make contract termination a possibility. Another aspect of early contract termination due to actions by the public procurer is that the private partner must be compensated. The main objective in terms of compensation should be to ensure that the private partner is compensated to an extent that minimizes the financial difference if the PPP contract had been fulfilled. With regard to the definition of the exact circumstances for contract termination by the private partner this can only be done with the specific project as the point of departure.

The PPP contract should contain provisions on the valuation of the PPP asset in case of breach. The valuation principles must ensure on the one hand that the public procurer takes over the PPP asset on financial terms which reflect the fact that a breach exists, i.e. at a discount to the original acquisition cost, and on the other hand if the contract is terminated for breach, it would be in the interest of the public procurer to have the value of the PPP asset determined at a level which is acceptable to the PPP provider's financier in order to limit the total loss as much as possible and to treat the risks associated with the termination for breach in an appropriate manner.

B LEGAL ASPECTS OF PUBLIC LENDING IN DENMARK IN RELATION TO THE PPP MODEL

Debt financing is allowed within delimited areas which have been positively listed in the Danish executive order on loans. This primarily pertains to investments within the field of utilities, energy upgrading as well as social housing. The permitted debt finance, which is named the loan facility, is defined in the executive order on loans.

PPP projects are treated as lease agreements which are considered to be loans provided that the conclusion of the agreement replaces a public investment.

The purpose of treating the PPP projects as loans is to neutralize the liquidity gains achievable by the authority by entering into an agreement on the use of the fixed asset instead of buying the fixed asset. PPP organizing of a project may therefore not – disregarding any special exemption possibilities – give the municipality or the region an opportunity to increase liquidity as compared to constructing the asset itself or entering into an ordinary lease agreement.

The conclusion of the PPP contract, however, does not count as a loan if the public procurer also deposits an amount in a separate account with a bank or deposits bonds of a similar market value with a bank, a mortgage credit institution or with KommuneKredit.

C EUROSTAT RULES

The treatment of PPP projects in the national accounts matters as it reflects the government debt and deficit which are regulated under the Maastricht Treaty through the Excessive Deficit Procedure (EDP) of the Stability and Growth Pact.

Under the EDP, there are strict regulations of the government deficit and debt of EU member states. The annual budget deficit is expected to be less than 3% of GDP and the public debt less than 60% of GDP. As a general rule, a government must report in the national accounts those assets for which it bears most of the risk. This is illustrated in Figure 30.

Figure 30: **European Investment Bank risk matrix**

Accounting treatment of PPP according to ESA95 rules				
	Risk type			"On" or "off" government balance sheet
	Construction risk	Demand risk	Availability risk	
Who bears the risk?	Government	Government	Government	On
			Private	On
		Private	Government	On
			Private	On
	Private	Government	Government	On
			Private	Off
		Private	Government	Off
			Private	Off

- Construction risk covers events related to the construction and completion of the PPP assets on time and on budget. In practice, it is related to events such as late delivery, non-compliance with specified standards, significant additional costs, technical deficiency and negative externalities (such as environmental impacts) which trigger compensation payments to third parties.
- Availability risk covers situations where, during the PPP's operational phase, an underperformance linked to the state of the PPP assets results in services being partially or wholly unavailable, or where these services fail to meet the quality standards specified in the PPP contract.
- Demand risk relates to the variability of demand (higher or lower than expected when the PPP contract was signed), irrespective of the performance of the PPP company. Such a change in demand should be the consequence of factors such as the economic cycle, new market trends, a change in final users' preferences or technological obsolescence. Demand risk is part of the usual commercial risk borne by private businesses in a market economy.

If the SPV bears the construction risk, the assets will most likely be "off" balance sheet items in the national accounts. Only if the government bears both the demand risk and the availability risk, the assets will be classified as "on" balance sheet items even though the SPV has the construction risk. In reality it is not necessarily clear which partner bears e.g. the construction risk. The government might bear the risk of externalities like grounding, while the SPV bears the risk of procurement of material, the risk of increased labor costs, etc.

In Denmark, however, the public debt, at 27% of GDP, is so much below the debt limit of 60% that whether the assets should be "on" or "off" balance sheet items is almost irrelevant.[60]

Government guarantees normally do not influence the classification of the assets in the national accounts as these are contingent liabilities which are treated as "off" balance sheet items. However, guarantees covering more than 50% of the capital cost of the PPP project should be recorded "on" the balance sheet.

The relevant guarantees to look at when classifying PPP assets are:

- Partial or total credit guarantees;
- Minimum revenue guarantees; and
- Guarantees of minimum demand provided to the non-government partner.

The aggregate impact of these guarantees decides whether the PPP asset should be "on" or "off" balance sheet items.[61]

D DANISH EXPERIENCES WITH TRADITIONALLY ORGANIZED INFRASTRUCTURE PROJECTS

D.1 INTRODUCTION

In addition to the PPP model, a number of different organizational models can be used to carry out public infrastructure projects.

Two general models exist for projects in which the public procurer has an active hands-on role; these models are defined as follows:

- The traditional infrastructure procurement model (TIP): The public procurer is significantly involved in the design, planning, construction and operation & maintenance (O&M) of an infrastructure asset and holds a number of contracts with different private partners. The various elements of the infrastructure project are not bundled in a structured way.
- The public company model (PC): The project is placed in a separate, legal entity owned and financed by the government, regions and/or municipalities (for example, Sund & Bælt, Metroselskabet and CPH City & Harbour Development).

Two general models exist for projects in which the public procurer does not have an active hands-on role; these models are defined as follows:

- The private market model: The public procurer rents infrastructure constructed, maintained and financed by the private sector (for example office buildings).
- The regulated market model: The public procurer provides a regulatory framework that incentivizes the private sector to develop, construct and operate assets (for example the wind power industry).

D.2 TIP AND PC MODELS

D.2.1 COST OF FINANCE

The TIP and PC projects are financed through the current budget or obtain funding in the sovereign bond market, either directly (state assets) or indirectly (municipal assets through KommuneKredit[62]). Financing an asset in the sovereign debt market means that the cost of finance reflects the creditworthiness of the state.

Public financing via the TIP model is incorporated directly into the national accounts. In the case of the PC model, the required capital is injected into a SPV by the public procurer(s) and will be public debt.

D.2.2 DIVISION OF RISK

The public procurer typically retains most project risks as well as the interface risk between various contracts. The TIP and the PC can, however, also employ different methods to put more focus on risk estimation and allocation:

- Turnkey contracts under which the private partner carries significant risks during the construction phase
- Design & construction contracts under which the public procurer employs the design & construction method. Examples comprise both the Oresund fixed link and the coming Femern fixed link
- "Collective bidding" in which the private suppliers (i.e. constructor and facility manager) have taken part in the procurement process together and hence coordinated their bids before submission

Collective bidding aims to reduce some of the interface risk between the design, construction and maintenance phases, as the private partners coordinate their bids before submission. However, there are no incentive mechanisms in place to ensure continued alignment post-bidding, so any issues arising during construction or operation are left with the public procurer, governed by the traditional contract structures. Furthermore, the facility manager's obligations are normally limited to the following agreed procedures and plans rather than living up to a set of pre-agreed functional requirements and also taking responsibility for the technical solutions and products selected by the constructor.

D.2.3 SPECIFICATION METHOD

Typically, detailed input-based specifications are used, entailing that there are clear instructions as to the design of the asset. The input-based specifications will in detail describe the materials, the workmanship standards, the working processes, etc. required to achieve the desired outputs. Usually, the winning private company is the company that can deliver the input specifications at the lowest cost within a certain time frame.[63]

The input-based specifications thus give the private partner clear instructions, but also less flexibility in performing the task. Perhaps even more importantly, the input-based approach does not transfer risk to the private partner. Since the public sector prescribes activities and input, it is also responsible for whether or not the prescribed activities bring about the desired outcomes.

D.2.4 LIFE CYCLE ECONOMICS

The life cycle economics is typically governed through multiple contracts with different partners and, as regards the operation phase, are typically entered into after the asset has been constructed. This means that the architect and the technical designer of the project are typically not incentivized to make decisions based on operational efficiency or low maintenance cost. Instead, it is up to the public procurer to evaluate the incoming bids for O&M efficiency along with all the other parameters of the bid.

The TIP and the PC can, however, also employ a life cycle economics approach; for example when Metroselskabet awarded the construction of the Copenhagen Metro, the consortium also had to operate the system for the first few years.

D.3 PROJECT PERFORMANCE

Because the public procurer has retained a significant part of the project risks, many TIP and PC projects have experienced significant delays and cost overruns.

D.3.1 TIP MODEL

In a Danish study conducted by the Danish National Audit Office in 2008, approximately 20% of projects with budgets above DKK 10 million exceeded their anchor budget by 10% or more. Seven out of 18 projects with budgets above DKK 100 million had overruns of more than 10%.[64]

D.3.2 PC MODEL

D.3.2.1 THE GREAT BELT BRIDGE

The project comprised three different constructions: the East Bridge for road transport, the East Tunnel for rail transport and the West Bridge for road and rail transport combined.

The construction work was carried out by Sundlink Contractors, a consortium of Skanska, Hochtief, Højgaard & Schultz (which built the West Bridge) and Monberg & Thorsen (which built the eight-kilometer section under the Great Belt). The work of lifting and placing the elements was carried out by Ballast Nedam using a floating crane.

The East Bridge was built between 1991 and 1998, the West Bridge between 1988 and 1994 and the tunnel between 1989 and 1997.

Originally the plan was to open for railway traffic in 1993, giving the trains a head start of three years over road traffic to begin in 1997, but train traffic started in 1997 with a 4-year delay and road traffic in 1998 with a 1-year delay.

The original construction budget from 1987 was DKK 13.9 billion (1988 prices). A little over a year later, the budget increased by 25% as a result of pre-construction investigations being taking into account and capitalized into the budget. Over the next three years the budget rose another 9% mainly due to a design change of the East Bridge. The budget then again increased over the next 1.5 years by 14% mainly because the risks assumed by the public procurer were identified, capitalized and allowed for in the construction budget. Eventually, the actual construction cost turned out to be 55% higher than originally expected.[65]

D.3.2.2 THE ORESUND BRIDGE

When the construction of the Oresund Bridge was decided, it was expected that the coast-to-coast connection would cost DKK 11.7 billion (1990 prices) and the onshore infrastructure would cost DKK 3.2 billion (1990 prices).

The final construction cost for the coast-to-coast connection amounted to DKK 14.7 billion (1990 prices) corresponding to an increase of DKK 3.0 billion (1990 prices) or 26%. DKK 0.5 billion (1990 prices) of the budget increase, or 17%, was attributable to the risks assumed by the public procurer that were identified, incurred, capitalized and allowed for in the construction budget. The remaining part of the budget increase was mainly attributable to design changes.

The final construction cost for the onshore infrastructure amounted to DKK 5.3 billion (1990 prices) corresponding to an increase of DKK 2.1 billion (1990 prices), or 66%. DKK 0.7 billion (1990 prices) of the budget increase, or 22% of the original budget, was attributable to the risks assumed by the public procurer that were identified, incurred, capitalized and allowed for in the construction budget. DKK 0.9 billion (1990 prices) of the budget increase, or 28%, was attributable to higher-than-expected costs for expropriation, changed design and larger construction scope.[66]

In terms of timing the construction activities finished on time.

D.3.2.3 THE METRO

The estimated construction costs for Metro lines 1, 2 and 3 went up from DKK 3.9 billion (1999 prices) in 1992 to DKK 6.9 billion (1999 prices) and to DKK 9.3 billion (1999 prices) in 1999. The increase from 1992 to 1996 was due to the fact that the choice of transport system was only made in 1996 and this more expensive solution would enable a lower O&M cost and improve the basis for sale of acreage in Ørestad. The increase from 1996 to 1999 was due to an expected increase of cost for line 2b and the introduction of a budget reserve to absorb anticipated extra costs due to the delay of the project.[67]

D.3.3 DYNAMIC PAYBACK PERIOD

One way to finance deteriorated life cycle economics, e.g. construction cost overruns, is to increase the payback period of the asset. To illustrate how this works, a number of examples of how the materialization of various risks influence the payback period in the PC model are outlined below. This is finally illustrated by a comparison with private financing.

Example 1 – best-case scenario: A particular asset costs DKK 10 billion to construct and it is expected that the operating income generated by the asset is DKK 500 million annually. The asset can be organized through a PC with the associated low cost of finance, 1% p.a. on a 6-year government bond. In the best case, the asset can be refinanced after the maturity of the bond at the same interest rate, resulting in a lifetime cost of finance of 1%.

Example 2 – 10% increase in construction costs: The cost of construction increases by 10%. As the asset is constructed as a PC, the risk lies with the public procurer and the payback period is increased by two years.

Example 3 – interest-rate increase from 1% to 5% after six years: The interest rate increases from 1% to 5% when the loan is refinanced. This increases the payback period by 12 years.

Example 4 – decrease in operating income by 10%: The operating income of the asset decreases by 10%, which increases the payback period by 18 years.

Example 5 – all the above examples 2, 3 and 4 are realized: The payback period increases from 23 years to 100 years.

Example 6 – private funds: The private partner requires an annual return of 5.7% equivalent to the expected income from the asset of DKK 500 million and an additional payment of DKK 200 million from the public procurer to the private partner. The risks mentioned in examples 2, 3 and 4 still exist but are transferred to the private partner. Furthermore, as the contract stipulates the level of payment from the public procurer to the private partner as well as the lifetime of the contract, the private partner cannot make up for losses by extending the lifetime of the contract. Consequently, if a risk materializes, the private partner can either cut the cost of production (increasing efficiency) or accept the loss.

#	Org. form	Event	Public construction payment, DKKm	Annual income from asset, DKKm	Interest rate	Payback period
1	TIP/PC	Best case	(10,000)	500	1.0%	23 years
2	TIP/PC	10% increase in cost of construction	(11,000)	500	1.0%	25 years
3	TIP/PC	Interest rate increase from 1% to 5% after 6 years	(10,000)	500	1.0% → 5.0%	35 years
4	TIP/PC	Decrease in operating income by 10%	(10,000)	450	1.0%	41 years
5	TIP/PC	2, 3 and 4 in the same scenario	(11,000)	450	1.0% → 5.0%	100 years
6	PPP	Events do not affect the cost for the public part	-	700	5.7%	30 years

Examples of how a PC asset has a dynamic payback period include A/S Storebælt and A/S Øresund, which have changed the debt forecasts of the assets multiple times, both increasing and decreasing the payback period.[68]

While the above examples are for illustrative purposes only, the Danish National Audit Office found in its report on Metroselskabet[69] in 2010 that if the real interest rate increases from 3% to 5% and the construction cost increases by 5%, Metroselskabet can only repay its debt if the annual income from passenger fees increases by at least 10%.

An increase in the payback period is an increased cost of the asset. While it does not mean that current generations will be facing an increase in the cost to use the asset, the asset will take up investment capacity for future generations. Consequently, the lack of risk control in the acquisition of the asset is, all else equal, a transfer of wealth from future generations to current generations.

E BENT FLYVBJERG ON VALUE FOR MONEY OF PUBLIC-PRIVATE PARTNERSHIPS

E.1 INTRODUCTION

On November 12, 2012 Brisconnection suspended trading its stocks on the Australian Stock Exchange. Brisconnection operated the AUD 4.8 billion toll road that connects the Brisbane airport to the city. Three months later, the lenders pulled the plug. Brisconnection collapsed under its AUD 3 billion debt, after less than half of the forecasted toll revenues had materialized.[70, 71] The public-private partnership (PPP[72]) suffered the same fate as Sydney's Lane Cove and Cross City tunnels, and Brisbane's Clem7 tunnel.[73] Moreover, Australia is not a special case. The US saw the collapse of San Diego's South Bay Expressway, Washington D.C.'s Dulles Greenway, and the Austin-St. Antonio toll-road.[74] The UK, the most adamant champion of PPPs, saw the collapse of the London Underground maintenance firm Metronet.[75] The UK government also needed to bail out PPPs in the National Health System.[76]

These and many other PPPs were sold on three promises:

- Better project performance: Building to time and on or under budget,
- More innovation: Improve the quality of infrastructure and services, and
- Risk transfer: Achieve better risk allocation and management.[77, 78]

Additionally, critics argue that the PPP policy has been driven by ideology and off-balance sheet finance.[79] This begs the question: How can PPPs keep their promises? How can PPP collapses be avoided?

E.2 BETTER PROJECT PERFORMANCE

To date, no systematic and robust study has compared the performance of PPPs with conventionally procured projects. Often cited reports showed that three out of four PPPs delivered on time and on budget.[80, 81, 82, 83] Disputing studies reported that PPPs have 24% higher unit costs and have the same magnitude of cost overruns as traditionally procured projects.[84]

In the absence of conclusive evidence, the question becomes: What is the rationale to assume that PPPs perform better? Three different causes are commonly discussed: (1) standardization, (2) bundling of project phases, and (3) incentives.

First, successful solution providers are better able to balance between standardization and customization of the project.[85] PPPs have been successful where agreed, recognized, and well-understood engineering standards for operations exist.[86] Standardization has driven efficiency gains, for example, in catering and cleaning services of PPPs in the UK National Health System,[87] but other soft services in the health care sector proved problematic.[88] Conversely, the UK prison PPPs have shown that similar gains can be achieved if a public sector operations organization bids as a competitor against the private sector.[89]

Second, supporters of PPPs argued that bundling[90] of design, build, and operation phases with one prime contractor creates efficiency gains.[91] Employing a prime contractor to deliver the PPP has the opportunity to ensure that innovation and costs are managed through the full life cycle.[92] However, this requires that the right incentives are set throughout the life cycle, which in turn requires advanced contracting skills.[93] Better performing PPPs with a prime contractor have delivered efficiency gains supported by a strong central structure and using private-sector expertise.[94] However, analyses showed that prime contractors need to split PPPs internally into design, build, and operations teams to deliver. Nonetheless, bundling can speed up delivery particularly if the design, build, and operations teams overlap and improve knowledge exchange across phases. Moreover, bundling project phases with one prime contractor may keep the customer involved after the design phase. While the use of a key contractor simplifies the transactions on the one hand,[95] delivering value for money on the other requires more customer involvement in the PPP.[96] Concerns have been raised whether the public sector lacks the tenacity and skill set to engage over a long period of time.[97]

Third, financial incentives, e.g. cost and revenue sharing, have the greatest potential of improving delivery.[98] In the UK, PPPs have delivered faster due to incentives for early delivery, e.g. via the principle "no service – no payment".[99] In the US, revenue sharing has lowered the design and construction costs of new highway facilities and increased the generated revenue through toll rate increases, decreases in toll evasions, and more profitable rest stop concessions.[100]

However, bundling of project phases with a prime contractor requires complex and detailed contracts. Additionally, incentives, e.g. based on performance outcomes, further add to contract complexity, which has been shown to limit flexibility and discourage innovation particularly across the full life cycle.[101] Additionally, PPPs often lack full life cycle performance metrics on which incentives could be based.[102] But most importantly, the public sector tends to lack the organizational capabilities to administer contracts properly. For example, 36% of the UK NHS trusts have less than one full-time contract manager and 12% of trusts have no one managing their PPP contracts.[103]

In sum, while robust empirical evidence is missing, individual cases suggest that PPPs may improve project performance. Particularly through standardization between projects, bundling and overlapping of project phases that would otherwise be separately procured, and performance incentives.

E.3 MORE INNOVATION

Innovation has not only the potential to deliver services and products at a higher quality; innovation is also another potential driver for efficiency gains.[104] The evidence is somewhat unexpected.

On the one hand, PPPs show the potential for innovation, even if the innovations achieved are slightly generic.[105] The innovations achieved are typically specific to a project phase. Overall there is little evidence for innovation across life-cycle phases.[106] Moreover, incentive schemes put more emphasis on short-term construction cost savings than long-term innovation.[107] However, innovation can be achieved, specifically if the same management team delivers the PPP throughout its life cycle.[108]

On the other hand, while the overall level of innovations on individual PPPs is low, valuable innovations can be achieved at the industry level. Breaking-up the conventional public sector monopoly created innovation, as demonstrated by the emergence of new players in the market.[109] Innovations and efficiency gains may be achieved if solution providers learn from delivery of multiple PPPs.[110] Cases from Spain, Sweden, and the EU observed that innovation and R&D create competitive advantages in bids.[111] Thus, innovation creates for individual PPPs during tender and particularly if they set specific requirements for design, quality or environmental impact.[112]

In sum, PPPs can achieve innovation. Innovation on individual PPPs is limited. However, analyses point to a high potential of industry-level innovation, which can be amplified by incentives and specification constraints.

E.4 RISK TRANSFER

Risk transfer in PPPs is thought to have the potential to offset the higher cost of private finance.[113] Risk transfer to private parties has resulted in 10-30% cost savings in several PPP projects.[114, 115, 116]

Do PPPs have lower risks? Risk transfer is mainly achieved through a mix of equity and debt.[117] Particularly, equity sharing with subcontractors can have positive effects on the overall project risks.[118]

Additionally, the spread between internal rate of returns and financing costs indicates that most PPPs anticipate small cost overruns and schedule delays.[119] The biggest viability risk, however, is the demand risk, as the Australian PPPs have demonstrated.[120] Most PPPs transfer demand risks to the private side. The public side, however, might be better equipped to deal with demand risks. Particularly if policy decisions influence demand, e.g. schools, hospitals, but also toll roads that are affected by the overall road network.[121] One solution is to provide guarantees for minimum revenues, which limit the private operator's exposure to demand risk.[122] Another solution is to include unilateral termination options in contracts.[123] Ultimately, the option of bankruptcy protects the private side,[124] however, investors (often superannuation funds) then bear the risks.[125]

Is optimism bias, i.e. the misunderstanding and misrepresentation of risk, more prevalent in PPPs? The evidence here is inconclusive. On the one hand, the inclusion of private capital can increase the scrutiny on plans and reduce optimism bias.[126] On the other hand, UK experiences suggest that optimism bias remains steady[127] if not increases because of the long-time horizons.[128] However, the UK case also shows that independent scrutiny on project proposals (e.g. by government auditors, departmental, and cross-departmental review boards) curbs optimism in cost, schedule, and revenue forecasts.[129]

Plus, the case studies point to three commonly ignored risks in PPPs. The private side often overlooks reputation risks[130] and political risks, for example changes of government often trigger unsuccessful renegotiations of PPPs.[131] Whereas the public side often overlooks functional risks (i.e. the risk of falsely specifying today how schools will be delivered in 20 or 30 years[132]) and the risk of being locked-in in the procurement of services that might not be needed in the future.[133]

Lastly, it is too early to assess the effects of the long contract periods of PPPs. The long-term nature limits governments' ability to impose new regulations onto private partners.[134] Additionally, practice examples show that renegotiations are particularly lengthy for long-term contracts.[135] This underlines that PPP contracts are incomplete, particularly because they span very long time horizons. Consequently, the trade-off between contractual flexibility and complexity needs to be carefully considered. Furthermore, notwithstanding the type of contract or agreed risk sharing, governments are ultimately accountable for the PPP outcome,[136, 137] up to the point where bailouts might be needed.

In sum, risk transfer has the potential to create benefits large enough to offset the PPP finance costs. Particularly, a joint equity structure has the potential to reduce cost and schedule risks. The greatest viability risk in PPPs sits with optimistic revenue projections. Independent scrutiny can help.

E.5 AVOIDING FAILURE

The collapse of the Australian PPPs might sound alarmist, however, only 52% of UK authorities surveyed by the NAO in 2001 reported that their PPPs delivered excellent or good value for money.[138] The review of evidence from practice and academia has shown that PPPs have the potential to keep their promises to improve performance, to transfer risk, and to achieve innovation. How a PPP delivers value for money differs from industry to industry and project to project. Yet, the underlying policy framework can prevent failure and disappointment.

Key to a robust policy framework are symmetrical accountability[139] plus strong enforcement processes, which must have the ability to actually stop projects.[140] This ensures that all parties pursue the common interest rather than their self-interests. Accountability needs to exist for both sides of PPPs:

- *Public sector accountability* can be created through transparency and public control.[141, 142] Transparency not only improves decision-making[143] but also enables public control. Performance data of PPPs and suppliers need to be collected and should be available across government. The involvement of private partners has served as an excuse to circumvent existing transparency regulations and prevent public accountability.[144] However, even during competitively sensitive project phases, independent project reviews and data-driven due diligence[145] can be carried out by the government comptroller to scrutinize plans and stop non-viable projects.[146]
- *Private sector accountability* can be achieved via "skin-in-the-game"[147] and competition. First, private partners need to finance at least one third of the project[148] to have sufficient "skin-in-the-game". Government guarantees are often counter-productive because they shield private partners from risks. The right "skin-in-the-game" ensures that PPP viability is tested and risks acknowledged. Second, competition is important for private sector accountability.[149] It prevents strategic behavior and limits future chances of the private partner to force the government to renegotiate the terms of the contract.[150] Third, private financiers have been observed to increase scrutiny to improve monitoring and control of PPPs.[151]

E.6 CONCLUSION

While several PPPs struggle to meet their goals, empirical evidence from academia and practice suggests that PPPs actually can deliver on their promises to improve project performance, to achieve innovation, and to transfer risks. To prevent PPP failure, a strong policy framework is needed. Best practices entail independent project reviews, and enforcement processes, which hold all responsible parties accountable for their actions and inactions. Moreover, strong project and contract management capabilities are needed to equalize differences between the public and private sector. Most of all, the highest potential to create value for money through PPPs lies in industry-level innovation, which ought to be supported by learning between PPPs, as well as learning between the public and the private sector.

E.7 CASE IN POINT: PUBLIC-PRIVATE PARTNERSHIPS IN THE UK

In 1992, the UK government introduced a public-private partnership policy: the Private Finance Initiative (PFI[152]). It is the most comprehensive policy framework to date and a model that has served as example for similar policies and programs around the world.

The UK National Audit Office (NAO) concluded[153] on the value for money of PPPs:

> "The Government needs to act as a more **intelligent customer** in the procurement and management of projects. **Value-for-money** will be improved through **officials being proactive** in: collecting data to inform **decision-making**; ensuring they have the right **skills**; establishing effective arrangements to **test**, **challenge** and, if necessary, **stop projects**; and using **commercial awareness** to obtain better deals. In the current climate, PFI may not be suitable for as many projects as it has been in the past." [Emphasis added]

Furthermore the UK experience shows that PPP policy and project decisions must center on value for money. A second key learning is that PPP decisions need independent reviews. Those reviews must have the authority to stop a project.

PPP success factors

Summarizing the experience made in the UK shows that successful PPPs[154, 155]…

- …considered alternative solutions and forms of procurement
- …specified information needs before decision-making and kept track of project performance after decision-making
- …based their decision for PPP procurement on value-for-money criteria
- …identified long-term service needs
- …could handle complexity
- …managed the interfaces between central government and local bodies
- …had skills that matched those of the private sector and were a comparable partner in contract negotiations
- …established good contract management procedures
- …pursued efficiencies
- …put the project under continuous and systematic scrutiny

The chapter will next summarize the positive and negative experiences with PPPs in the UK and contributing factors.

Creating value for money

	Outcomes	Contributing factors
	• Delivery of assets that might be difficult to develop • Efficient risk allocation and maintenance • Delivery of innovative solutions • Delivery to time and price • Fewer contractual errors • High due dilligence	• Availability of data • Payment incentives • Equity investments by subcontracters
	• Reduced contract flexibility • Kept public sector ultimately responsible for project risks • Lead to delays • Increased commercial risk and finance costs	• Inadequate data for decision-making • Insufficient skills in public sector • Cost of private finance • Lack of systematic scrutiny

PPPs have shown to deliver benefits. However, PPPs are not the suitable method at any price or in every circumstance. Key benefits that PPPs have achieved include:[156]

- Delivery of assets that were difficult to develop or to finance in conventional projects
- Efficient risk allocation and maintenance
- Delivery of innovative solutions
- Delivery to time and price
- Fewer contractual errors
- Higher due diligence

The three contributing factors that helped create value for money are (1) availability of data, (2) use of payment incentives, and (3) equity investments of subcontractors.

First, a key strength of the UK public sector is *availability of data* on PPP performance. Key data about all contracts are stored centrally.[157] PPPs adequately measure and share data also perform to expectation.[158] Moreover, a central data repository creates public scrutiny through media enquiries, other countries have learned from this experience, e.g., British Columbia's Major Projects Inventory,[159] Chile's database of PPPs.[160]

Second, *payment incentives* proved to be highly effective. The "no service – no payment" principle ensured that the private sector does not receive payments before services are being delivered. The majority of the UK PPP contracts delivered on-schedule and on-budget because of these incentives.[161]

Third, *equity investment* played an important role. The design of the investors' subcontracts and subsequently investors' oversight of subcontractors improved project performance.[162]

Destroying value for money

PFIs have not unconditionally resulted in better value for money. PPPs failed to deliver value for money when PPP procurement was chosen only because of the lack of a realistic funding alternative (e.g. soft infrastructure PPPs in the housing estate and PPPs to run hospitals for the National Health Service).[163] Moreover, several maintenance contracts failed to deliver value for money, one in five maintenance contracts in the National Health System did not meet expectations.[164]

Overall, PPPs have revealed several weaknesses that prevented them from delivering value for money. Those include:[165]

- Reduced contract flexibility
- Keeping public sector ultimately responsible for project risks
- Leading to delays
- Increased commercial risk and finance costs

A key root cause was *inadequate data for efficient decision-making*. Recent PPP projects showed that procuring authorities have failed to adequately specify requirements and failed to explore alternative procurement options.[166] Rushing the front-end process caused delays and extra costs.

Additionally, the public sector still lacks sufficient skills. Despite improvements, skills are generally not as well developed as those of the private sector. The public sector is particularly disadvantaged at managing contracts and negotiating contract variations.[167]

Moreover, the cost of private financing has increased. Due to the financial crisis loan margins on recent PFI deals have increased. As a result, the cost of borrowing under PFIs has risen substantially, which eroded the value for money advantage.[168]

Finally, PPPs lack systematic and stringent scrutiny. To date, not all PPPs receive an appropriate review. A systematic and stringent scrutiny could have identified and stopped non-viable projects.[169] It is noteworthy that not a single PPP was stopped.

In sum, the UK experience shows that the higher (and increasing) cost of financing of PPPs can be successfully offset. The government needs to be a mature customer, i.e. able to specify needs, keep track of delivery, negotiate and manage contracts; and that the government needs to have teeth, i.e. stop under-performing projects, make local and central bodies accountable, scrutinize schemes and decisions.

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152 It should be noted that the PFI policy differs slightly from the general use of PPP. PFI is devised as a particular method to finance private investment, whereas PPP describes partnerships, involving more flexible methods of financing. However, this analysis of the strengths, weaknesses, opportunities, and threats of the value for money of PPPs applies to PFIs as well as PPPs. However, the access to funding incentive was removed in September 2010. Under UK GAAP, PFI/PPP arrangements were accounted for in accordance with FRS 5, thus mostly off-balance sheet for the government. With the transition to IFRS, PFI/PPP arrangements are accounted for in accordance with IFRIC 12 thus now mostly on-balance sheet for the government.

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