Contents

Introduction

This is the new manual for the Public Sector Comparator (PSC). The PSC is a new instrument which we expect will be further developed over the next few years. This manual is a revision of the manual issued in 1999 and includes new insights and project experiences. In Appendix E the differences between the old and new manuals are explained.

The PPP Knowledge Centre has published a Public Private Comparator (PPC) manual as well as this PSC manual. These manuals, which describe how to apply the two financial comparators, form part of a series of documents aimed at providing a better understanding of PPP procurement and include experiences already gained in this area.

The PPC and PSC are the first instruments which provide insight into the possible added value of a PPP procurement by comparing the PPP procurement option with the public approach. Furthermore, the PSC gives you an idea of the total project costs over the project life cycle.

This manual is intended for members of the PSC team within a project organisation (see Module 1). The PSC team is responsible for the quality of the PSC. Others, who are more indirectly involved with the creation of the PSC, such as decision-makers and auditors, will find this manual useful to understand the methodology and process of creating the PSC.

The aims of the PSC are twofold:

1 It provides an insight of the total costs, income and risks over the project life using public procurement. The results can be used as a **benchmark** in the subsequent public procurement.
2 You can use the benchmark to make a comparison with the final PPP tender proposal. The results of the comparison show whether the bids resulting from a PPP procurement are better value for money compared to a public procurement option.

Before you start to draw up the PSC benchmark you must check whether all the preparatory work for the PSC is complete. You should take the following initial conditions into account:

- is the scope of the project clearly defined?
- has a risk analysis been carried out and have all the risks been subsequently clearly allocated?
- has an output specification been drawn up?
- based on the experience and capacity of the public commissioning authority, has a public procurement option been defined which can differ from traditional procurement to a Design and Build (DB) contract?
- has a PPC been drawn up?

It is almost impossible to commence the PSC without the scope, risk allocation, output specification and definition of the public procurement option. It is also useful if the PPC has already been formulated. Much of the information concerning the project is then already available, and you also have a group of people who can start quickly with an instrument such as the PSC. In most cases the public procurement will already have started and there will be a deadline for the completion of the PSC.

Once the PSC is completed (as the benchmark), it will be continually refined or adjusted during the procurement (see the diagram on page 10) as improved information becomes available or when the allocation of risks or the output specification change. After the private bids have been evaluated the PSC benchmark can be finalised, and the compared to the PPP bid to determine whether the PPP procurement option is in fact better value for money.

Legal position of the PSC

A prudent commissioning authority will reserve the right to terminate a public tender procedure and not to award a contract if the tenders are higher than the PSC. The commissioning authority should inform bidders at the commencement of the procurement of this right, and should insist that participants in the tender procedure agree to this condition. However this is not all. The commissioning authority will also have to provide insight into the PSC methodology. The most appropriate time for this is during the consultation phase. Furthermore, at the point when the commissioning authority is considering cancelling the procurement, the organisations taking part in the procurement must be informed as to why such a decision is being considered. Finally, it is important to remember that in practice neither an arbitrator nor the court will permit the cancellation of the invitation to tender procedure without good cause. Diagram 1 shows the chronology of steps to be taken in the procurement, including the consultation phase.

Diagram 1: The procurement process

A. announcement of EU invitation to tender
- select the model for the invitation to tender
- publish in the Official Journal of the European Communities (=OJEC)
- issue prequalification document

B. selection
- pre-qualify candidates
- adjust specifications if necessary
- draw up the PSC benchmark
- consultation period with prequalified bidders

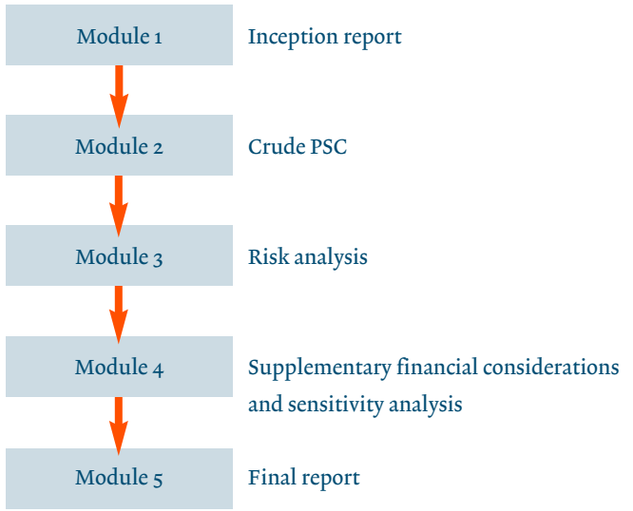
C. bids
- issue bids
- negotiate contract conditions
- select bidders/bids to participate in the final round
- issue final bids
- select a first and second choice of bid
- adjust the PSC benchmark and compare with the preferred bid

D. close contract
- commercial Close
- financial Close
- publish contract award in OJEC

This manual always discusses better value for money. This means that one of the procurement options is cheaper than the other. The PSC is an instrument for making financial comparisons and does not take into account non-financial aspects. Non-financial aspects can be of a qualitative or quantitative nature. Therefore, for some projects such as roads, the economic effect of early completion can be estimated.

Typical qualitative arguments which arise in such comparisons are:
- the strict division between the authority and contractor in PPP contracts;
- policy with regard to the changing role of government;
- the degree to which the authority wishes to be directly involved in the project;
- the importance of performance incentives in the contract etc.

The final decision between the public or the PPP procurement of a project should be based on all of the available information, financial and non-financial.
This manual consists of five modules which help you to draw up the PSC step-by-step.



As each module is explained, an explanation or concrete example is given to help you understand the proces. Where examples are given, this is noted in the text. The examples are attached in Appendix F.

Module 1: Inception report
This module describes how to start the PSC process, who should be involved, and which points you should consider from the very start in order to achieve a good final result.

Module 2: Crude PSC
In this module you create an overview of the categories of costs and income of the project. These are then put into a cash flow chart and their values estimated.

Module 3: Risk analysis
Here you indicate the risks involved in the project, value them and then add them to the cash flow chart.

Module 4: Supplementary financial considerations and sensitivity analysis
In this module you list all possible additional costs and income, value them if possible, and perform the sensitivity analysis.

Module 5: Final report
Here you determine the PSC benchmark. At the end of the tender procedure, and after adjusting the PSC to reflect changes in the allocation of risks and the output specification, the PSC is compared with the private tender.

Diagram 2: The 5 modules of the PSC manual

Module 1:		Inception report
Steps:	1a	basics product, plan and parties involved
	1b	the change protocol
	1c	the communication plan
Module 2:		Crude PSC
Steps:	2a	create an overview of costs
	2b	create an overview of income
	2c	calculate the crude PSC
Module 3:		Risk analysis
Steps:	3a	create an overview of risks
	3b	value the pure risks
	3c	value the spread risks
Module 4:		Supplementary financial considerations and sensitivity analysis
Steps:	4a	identify and analyse supplementary costs and income
	4b	identify and analyse the impact of different assumptions and variables (sensitivity analysis)
Module 5:		Final report
Steps:	5a	calculate the present value of the PSC
	5b	describe the results
	5c	confidentiality of the PSC
	5d	comparison with the private bids
	5e	management summary and recommendations

This manual also contains several appendices, in which the terms used are defined, the theory of risk analysis is explained, and a model change protocol is given. The appendices also include spreadsheets to explain the examples used.

If you require assistance in drawing up the PSC then the Dutch PPP Knowledge Centre can help you in several ways. The manual already indicates the points where we can give you support. You can also go to the manual's interactive 'PPP-PSC users' page' via our website (www.minfin.nl/PPS) where you can discuss the manual with us and other users as well as posting your specific questions. We hope that you will then be able to create a good PSC for your project.

Good luck.

The Hague, August 2002

Module 1: Inception report

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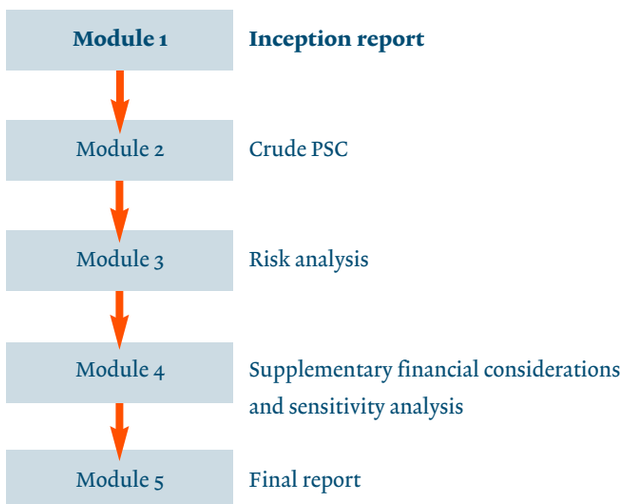

Step 1a: basics: product, plan and parties involved
Step 1b: the change protocol
Step 1c: the communication plan

We discussed the preparatory steps to be taken in preparing the PSC in the introduction. Now that you are going to start on the PSC Inception report your project will already have reached a certain stage:

- the initial PPP added value test will have been completed via the PPC;
- the scope, risk allocation and output specification will have been determined;
- the public procurement option will have been defined;
- the initial steps towards issuing a PPP invitation to tender have probably been taken.

This module explains how you initiate the PSC process, who should be involved at which point, and what you should take into consideration from the outset so that at the end of Module 5 you will have achieved the required results.

Purpose

The purpose of this module is to structure the process of creating a PSC. It is also designed to help members of the PSC team understand how to draw up a PSC, including the planning, costs, rules of the game, the change protocol, assumptions to be made and the communication plan.

Structure

This module first explains why you should make the Inception report and how you should prepare this. The module then goes on to describe why the Inception report should contain a communication plan and change protocol, and it explains how these should be made. When this groundwork is complete you are ready to start on the real calculations in the following modules.

Preparation

In order to draw up the PSC you must have a certain understanding of the scope, risk allocation and output specifications of the project. You use the PPC document which was made earlier to gain a better understanding and to give you ideas about:

- who you should involve in drawing up the PSC;
- where the bottlenecks are in the process and thus where you should adjust the plan to allow more time or resources for these aspects.

To get an idea of what is required you can also use Inception reports, communication plans and change protocols from other PSCs. The PPP Knowledge Centre can help you with these issues.

Output

You can draw up the Inception report, including the communication plan and the change protocol within two weeks. The PSC team leader is chiefly responsible for the Inception report, and may have some help from the PPC team. For the communication plan you can use an external consultant or someone from your public relations department. The PSC team leader should present the Inception report.

Step 1a: basics: product, plan and parties involved

Your Inception report is designed to structure the PSC process and to provide the decision-makers and other team members with an understanding of the whys and wherefores of the PSC. The most important test of a good Inception report is that the decision-makers and the PSC team members do not have any more 'who, what, why and how much' questions. An extensive example is given at the end of this module.

As mentioned earlier, the PSC team leader is the main author of the Inception report. In this part of the memo you should answer the following questions:

1. why am I making a PSC (goals)?
2. what assumptions should I make?
3. who should I involve when making the PSC?
4. which agreements should I make?
5. how much time and money will the PSC cost?

Sub 1. Why am I making a PSC?

Before you invest a lot of time and money in drawing up the PSC you should ask yourself: Why am I doing this, is it really necessary and is there not a simpler way to gather the data? This information will

motivate you and other members of the team for the tasks ahead. Furthermore, these are questions which your manager, the auditors and possibly other people will also pose. The Inception report is the proper place to explain the choices which you make to all parties interested in the 'why' question.

The PSC project leader can decide to answer all these questions alone. You can also use the process of finding answers to these questions to increase the support that you will need to complete the PSC. In that case, you can involve project leaders from previous PSCs, decision-makers and other members of the PSC team.

Sub 2. What assumptions should I make?

The answer to this question results in an overview of your assumptions which:

- make the PSC understandable;
- ensure that the specialists who will allocate values to various parts of PSC in the following modules base these on the same assumptions.

The list can be divided into two parts:

a. assumptions already made for this project;
b. specific assumptions made for the PSC.

For a. Specific assumptions made for the project

As discussed above, your project already has a scope, risk allocation, output specification and a PPC before you commence the PSC. Your project probably also has a set of bid requirements which describe how you will evaluate the bids and what assumptions the private parties should make when formulating their bids. The PSC develops this information and most of the underlying assumptions are based on it.

For b. Specific assumptions made for the PSC

You will probably make additional assumptions for the PSC. For example, about the perception of risk by the commissioning authority. Existing PSCs and the PPP Knowledge Centre can help you when formulating these new assumptions.

Sub 3. Who should I involve when making the PSC?

The most important part of this module is finding the right people to contribute to the PSC. You can distinguish between two types of contribution:

a. expertise concerning the content. This may be technical, financial or concerning the processes involved.
b. the provision of information to, and feedback from, the people who influence the project and the decision-makers, so that decisions can be made. It is also important to provide information to these people so that the project is consistent with their overall strategy. A secondary aim here is to create and maintain support for the project.

For a. Expertise concerning the content

The experts who can clearly help to draw up the PSC are those people who were involved in an earlier phase when the project scope was defined, the risk allocation was made, and when the output specifications and the PPC were drawn up. If other PSCs have already been made within the organisation, then you may decide to involve some of those participants in your project. For projects at government level there are a number of departments with their own PPP experts who can support the PSC team with their expertise.

It is usually also necessary to involve external experts in the process, certainly if this is the first time that the organisation has drawn up a PSC. The PSC differs from earlier tasks in content as well as in the processes involved:

- in contrast to the PPC, the PSC is a 'living' document. The initial PSC which you make before the bids are submitted (see introduction) will probably be different from the PSC which you use for the ultimate comparison with the best bid;
- in contrast to the PPC you calculate all costs, income and risks in detail for the duration of the project.
- the PSC does not take into account the risks and costs associated with the preparation of the project. In other words costs which are incurred prior to the commissioning of the services to be supplied.

- the PSC is the final check during the PPP procurement as to whether a PPP procurement option is better value or not. This can be a sensitive political issue.

External consultants often have specialized knowledge which is not available within the internal organisation of the authority. External experts can provide verification of the results or give a second opinion. It is advisable to obtain a second opinion to increase support for the PSC.

For b. The provision of information to, and feedback from, the people who influence the project and the decision-makers

A good team will keep in close contact with the supporting organisation, external decision-makers and people who have influence over the project. It is therefore advisable to include representatives from the authority, decision-makers and the people who influence the project in the PSC team as well as the necessary experts. If you involve them in the process at this stage, they will understand the results better and they will then find it easier to commit themselves. This is important for the decision-making process. You will find representatives of the decision-makers at policy officer and lower management levels within the organisation; people who have actually been involved with the project. Representatives of those with influence over the project will usually be less directly involved or outside the organisation. For government projects, these may include management from Financial and Economic Affairs of the responsible department and the Government Finance Inspectorate (Treasury Department).

Sub 4. Which agreements should I make?

The PSC team leader should define the formal arrangements for cooperation within the team and working with third parties, and the procedures for making changes to the PSC during the course of the project. This change protocol is described in full later in this module.

The arrangements for cooperation should include:
- the tools to be used, such as a workshop with experts;
- where there is doubt about the validity of the results, a second opinion should be obtained;
- the time to be spent and the distribution of costs;
- a commitment to accepting the results of the PSC by all members of the PSC team;
- agreements concerning the confidentiality of the work. This is discussed in more detail in the communication plan (contact with third parties) and in Module 5 Step c (the confidentiality of the PSC).

Sub 5. How much time and money will the PSC cost?

The team leader should summarise the expected timetable and costs again. As a guideline you can use experience gained in preparing previous PSCs. It will take about five to eight months to draw up the PSC. The time can be divided across the 5 modules as follows:

Inception report	1 - 2 weeks
Crude PSC	4 - 8 weeks
Risk analysis	4 - 8 weeks
Supplementary financial considerations and sensitivity analysis	4 - 6 weeks
Final report	4 - 6 weeks

Based on these guidelines you can make a detailed plan. Include in your plan who should contribute what and in which phase, and don't forget to plan in meetings with the PSC team.

It can be difficult to determine exactly how much time the team leader and members of the team will need to complete the PSC. This is partly dependent on the type of project and how complex it is. From experience we know that the project leader is usually required full-time, while some of the other team members may only be involved in the PSC for one day a week.

The cost of formulating the PSC and the subsequent comparison with the private bids is largely related to the time spent by the PSC team members and their advisers.

Step 1b: the change protocol

As discussed above, it is highly probable that the PSC which you draw up at the outset of the procurement will change as negotiations with bidders lead you to adjust some of the assumptions made. For example, you may have forgotten to include some costs or risks which only become apparent after the bids are submitted. In these circumstances you use the change protocol.

The purpose of the protocol is to create a transparent decision-making process and to avoid the criticism that the PSC is rewritten once the content of the bids is known. The protocol describes the circumstances under which the PSC may be adjusted, and may stipulate who may suggest, authorize and implement any changes. You may decide to give the original PSC, together with the change protocol, to a solicitor for safe-keeping to avoid suspicion from other parties, and to independently assess whether any changes were made in accordance with the protocol.

The change protocol should be approved by the entire PSC team and any decision-makers.

The change protocol is a standard part of the PSC. The easiest way to draft your change protocol is to adapt the sample change protocol given in Appendix D to your specific project circumstances.

Step 1c: the communication plan

The communication plan is used during the preparation of the PSC and later when it is compared to the private bids, and therefore the two parts of this section describe each of these steps.

Part 1. During the preparation of the PSC benchmark

During the preparation of the PSC all those involved should be informed about each step and each decision. You want to encourage them to contribute to the process as much as possible.

Experience with the PSC suggests that many more people than just the decision-makers and those people with direct influence on the project should be involved in the process for it to be accepted as a comparative instrument. For example in the High Speed Rail Link (HSL) Infra Provider project, the project organisation not only paid a lot of attention to informing local representatives on a timely and regular basis, but also to keeping the bidders well informed. Incidentally, this did not mean that the bidders were also shown the PSC figures.

Your team who are drawing up the Inception report are advised to create a communication plan for several activities which:

- will increase the involvement of members of the PSC team;
- will also increase the acceptance of the PSC by other than those directly involved in its creation.

This communication plan is intended for three distinct groups:

1. the decision-makers who will ultimately decide who will be awarded the project;
2. an 'active' communication group who are involved with the creation of the PSC;
3. a 'passive' communication group who only receive information about the progress of the process.

The first step in drafting the communication plan is to investigate which parties belong to which group, and then to create a detailed plan for each of the three groups.

For 1. The decision-makers who will ultimately decide who will be awarded the project

The decision-makers are not so much interested in the technical details of the PSC, as in the implications it has for their decision-making. You need to inform them in three different ways:

- to keep them informed of progress, directly or indirectly through their representatives.
- to explain the basic principles of PPP which are relevant for the PSC. An example may be questions in the Inception report concerning the life cycle costing approach.

For 2. An 'active' communication group who are involved with the creation of the PSC

The members of the 'active' communication group are part of the PSC team or are represented by others in the PSC team. Team members can only be properly involved if they feel well informed and can see that their expertise has a role to play in the creation of the PSC. The detailed plan should be designed to strengthen their contribution to the process and include as a minimum the following guidelines:

- create an overview of all members of the PSC team noting their function, expertise and responsibilities during the creation of the PSC;
- make written agreements detailing who should be involved in the various steps. This is especially important for the external consultants who may only be involved in one part of the PSC;
- agree how often and when team members work on the PSC;
- draw up some rules for the distribution of information and agree with members of the team that only the team leader is responsible for contact with external parties;
- agree about decision-making within the team: are decisions to be taken by majority vote, unanimous agreement or in some other way;
- agree about the confidentiality of the information. (See also remarks made earlier about agreements to be made.)

For 3. A 'passive' communication group who only receive information about the progress of the process

The 'passive' communication group is kept informed of progress with the PSC via communiqués which the team leader issues at important stages of the project milestones. They can react to these communiqués, but these parties have no direct influence on the project progress.

Part 2. During the comparison with the bids

When you have compared the PSC with the best bid, you can assess whether the PPP procurement option offers added value or not. Your project organisation should then decide whether the procurement should be continued or reconsidered.

Decision-makers will be keen to present a percentage saving for a PPP procurement. However, this percentage only shows the financial aspects of the added value for PPP development and is often subject to discussion.

Include in the communication plan how you will cope with this and which choices will be made. This part the communication plan should include at least the following:

- the timing of the presentation. The various phases in the procurement provide a communication opportunity, for example at the selection of the Preferred Bidder, at Commercial Close and Financial Close.
- the record of agreements about which parts of the PSC may be published. This depends mostly on the type of project and its social context.
- the appointment of a spokesperson.

Example

Step 1a: basics: product, plan and parties involved

A decision has been made for a PPP Invitation to Tender for the construction of the link road between the A101 and the A18. Taske Streefman has been appointed project leader. Following consultation with the responsible administrators Taske has decided to draw up the PSC. She defines the assumptions made for the project as clearly as possible in the Inception report. After discussing the Inception report with the PSC team she asks all those involved to show their commitment.

1. Why this PSC

By drawing up the PSC Taske will find out whether a PPP procurement will be better value for her project. The PSC will help the decision-makers in the ultimate choice of procurement option. Furthermore, the PSC will provide information about the entire project costs and income and the valuation of all risks identified.

2. Relevant assumptions

Taske Streefman makes a brief description of the project. The A101/A18 project involves the development, construction, management and maintenance, and the funding of a motorway (four lanes). This road will link the A18 motorway to the A101. The length of the road is 20 km. The road has one sizeable engineering strucure: a 3.2 km tunnel under an important inland shipping route. An office is also required near the tunnel to house the regional traffic control services with many ICT applications. The project scope includes the construction of the tunnel and the road but not the construction of the office. Some of the land near the road and the tunnel may be used for commercial purposes.

Using the output specification for the project, Taske notes the most important assumptions for the project:

- the dimensions of the road and the tunnel;
- noise levels should be consistently below 55 dB(A);
- the required availability of the road is 99% between 06:00 and 20:00 hours en 90% between 20.00 en 6.00 hours;
- the construction must conform to current building standards;
- the tunnel must have escape routes accessible within 150 m from any point in the tunnel.

Taske also notes several assumptions specific to this PSC:

- the road must be available from 01-01-2008;
- the contract period is until 31-12-2033;
- the commissioning authority wishes to transfer to the private parties those risk which thet are best able to manage.

3. Who to involve

Taske is project leader. Following consultation with the responsible administrators, Taske approaches several experts and a number of people whom she expects will be able to communicate well with the decision-makers. In the first place Taske calls on members of the team who worked on the PPC, supplemented by input from other experts. Taske considers herself to be ultimately responsible for the PSC. Her team consists of:

Taske Streefman	-	project leader
Mr A	-	former member of the PPC project team (technical expert).
Mrs B	-	former member of PPC project team (process expert).
Mrs C	-	former member of PPC project team (financial expert).
Mr D	-	representative from the Financial and Economic Affairs department at the Ministry of Transport, Public Works and Water Management.
Mr E	-	representative from the Government Finance Inspectorate.
Mrs F	-	representative from the PPP Knowledge Centre.
Mr G	-	representative from Rail Infra project organisation (has experience with PSC).
Mrs H	-	consultant from organisation X (risk valuation experience).

Taske also has a group of legal, communication and costing experts who are available on an ad-hoc basis.

4. Which agreements should I make?

The members of the PSC team each agree to spend at least one whole day a week on PSC activities during the next five to six months. However, as far as Taske is concerned, it is more important that all the team members are committed to creating a well thought out benchmark, which is properly substantiated. She expects more than just participation in the team. Everyone involved in the project should be committed to supplying the best possible data. Taske deliberately uses the term 'best possible'. She already realises that there will be much uncertainty surrounding some of the data.

The members of the PSC team agree to hold an expert workshop about risk valuation techniques in order to increase the precision of the output.

Taske agrees with the team members that the results of the PSC will be treated confidentially. The aim is that all members of the team will commit themselves to the results. The agreement is that if there is insufficient consensus concerning the results a 'validation' will take place. This means that an independent expert will be asked for a second opinion.

5. How much time and money will the PPC cost?

During the first PSC team meeting Taske explains the plan she has drawn up which contains the most important activities, the responsibilities of each team member and the target dates. Within six months Taske wants to have a substantiated PSC. The plan also includes an estimate of the costs involved.

Example Step 1b: the change protocol

See Appendix D

Example Step 1c: the communication plan

Taske wishes to inform the team members and the potential users of the PSC about the current preparation of the PSC benchmark and the comparison with the private bid that she will make at the end of the procurement.

She decides to make a separate communications strategy for the PSC benchmark aimed at:

- the decision-makers;
- the active communication group;
- the passive communication group.

The most intensive communication will be with members of the team, the active communication group. Here Taske makes a distinction between the more formal communication (concerning the expected contribution and responsibilities of all team members and other aspects such as the minutes of meetings) and informal communication. The informal communication is about discussion, agreement and being creative.

Taske wishes to keep the decision-makers informed of the PSC team activities by means of a short e-mail once every two weeks. Two team members will also draw up a short newsletter once every two months which is intended for a wider audience. Taske takes the responsibility for writing the e-mail messages. The decision-makers can also expect regular visits from Taske.

The passive communication group will receive the short newsletter and there will also be official press releases which will be written as required by the RWS (Directorate-General for Public Works and Water Management) public relations department.

For the comparison of the PSC with the private bid, Taske agrees with the PSC team and the responsible administrators that she will be the spokesperson. The RWS public relations department will provide support in this matter. Finally, a separate communication schedule is drawn up indicating the dates for communication with the private bidders and the press.

Module 2: Crude PSC

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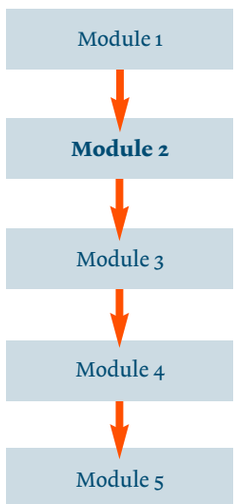


Step 2a: define the cost items
Step 2b: define the income items
Step 2c: calculate the crude PSC

Positioning
As described in the introduction, this manual guides you through the creation of the PSC in three parts:
- the crude PSC (described in this module)
- the risks (described in Module 3)
- the supplementary financial considerations (described in Module 4).

Expressed as a formula the PSC is calculated as follows:

PSC = crude PSC + risks + supplementary financial considerations

Purpose
The purpose of this module is to define all hard costs and income in a cash flow chart for the entire duration of the project.

Structure
First of all an overview is given of all the costs and income for the crude PSC. Then an explanation is given as to how these may be categorized. The third and last part of this module describes how to calculate the total value of the crude PSC.

Preparation
When you are formulating the crude PSC you use the information from the PPC. You will also need a cost and income expert - either use someone from your own organisation or hire in an external consultant. The PPP Knowledge Centre can help here. Start by planning how you will verify the costs and income and include the sources for all amounts in the report.

Output
The time required to draw up the crude PSC is usually 4 to 8 weeks. The results of this module are:
- a cash flow chart containing costs and income (excluding risks);
- a calculation of the total value of the crude PSC.

When you are formulating the crude PSC you can use the project example given in the examples (Appendix F) which shows the figures for Taske's project, the A101/A18 link road. In the example an exploitation period until 31-12-2033 has been chosen. For some parts of the analysis examples are given in the main document.

In order to create the crude PSC you will first have to identify the costs and income for the project. This is done in Steps 2a and 2b, which include categorization of the costs and income. The same categorization into project phases (transaction, realisation and exploitation) will recur in the following module when the value of the risks is calculated.
Finally, in Step 2c we explain how the total value of the crude PSC is calculated.

Step 2a: define the costs

In the crude PSC you start by creating an overview of all the costs which you would incur for a public procurement of the project. Before you can actually start your list, you will need to decide, with the help of the PPC, which point in the project you will start counting from.

The starting point is usually chosen as the point at which the public procurement process is started. This means that all the preparation costs, which are included in the PPC, should now be considered as sunk costs. These costs which will already have been incurred are not relevant to the specific public procurement process for which the benchmark is being created.

You supplement the cost overview (as well as the list of sources of income in Step 2b) with an appendix to substantiate the overview. This appendix includes:
- the timing of the expenditure and income;
- what falls under costs and income;
- the sources you have used.

The appendix makes it easier to make changes later on, without affecting the accuracy of the PSC and makes it easier to verify each item.

Note! One complication when drawing up the overview of costs is the possible overlap of the cost estimates and the risk premium. For example: a number of risks are already included in the RWS Infrastructure Project Estimation method. The PSC assumes a separate risk inventory and risk valuation, which is intended to list all relevant risks and to prevent risks being included twice. So if you do use the Infrastructure Project Estimation method you will have to filter out the double entries.

Output

Overview of all costs divided into:

- transaction costs;
- realisation costs;
- exploitation costs;
- appendix to substantiate the cost estimates.

2a.1 Transaction costs

Transaction costs are the costs made during the procurement. These are usually the costs of external and internal consultants for legal, technical, and financial support.

You can distinguish between the costs of the commissioning authority and the costs of the private parties taking part in the bidding process.

1. Commissioning authority

These are the costs involved in a public procurement option, which are paid directly by the commissioning authority. Examples are:

- the costs of agreements to clarify responsibilities when there is an overlap of sub-projects which are commissioned separately;
- part of the documentation and contact management costs incurred during procurement and construction.

2. Private bidders

These are the costs which the contractors and subcontractors incur during the procurement and which are included in their bids.

Based on their experience of public procurement, specialists will be able to estimate these costs.

Example

Step 2a1: transaction costs

Taske Streefman expects that both the bidders and the commissioning authority will incur transaction costs in the public procurement. For example, legal costs as a result of imposing a design over which the contractor has had no influence. Taske estimates the transaction costs in this case and includes this amount on Example 1 of the PSC. Taske substantiates this estimate in as much detail as possible and discusses the estimate with the PSC team.

2a.2 Realisation costs

When you have a full list of the transaction costs, then give an overview of the costs of realising the project. These costs are also known as the initial investment and should include not only the cost of design and construction, but and also the costs involved in modifying existing structures and the so-called opportunity costs of using existing structures within the project.

NB: Opportunity costs show the value of missed opportunities, such as when existing structures are used in this project instead of another project. The list below gives you an idea of these realisation costs:

- design costs;
- costs for the purchase or lease, and development of land;
- costs incurred in obtaining information in relation to the project;
- labour costs required for the construction;
- raw materials required for the construction;
- payments to suppliers;
- machines required for construction;
- insurance costs during the construction period;
- the cost of management during design and construction.

When estimating construction costs look at the definition of the public procurement option and assume the use of construction techniques that would normally be used in a public procurement. Assumptions made and sources used are noted in the appendix.

Example

Step 2a2: realisation costs

Example 2 shows the list of costs which Taske Streefman and the project team have finally drawn up. They used various sources in their search. Experts from the RWS organisation were consulted, information was taken from the PPC and from the project estimates which were made before the decision that the A101/A18 project would be procurred as a PPP project was taken. There were also discussions with external experts and with members of a project team that recently carried out a similar project. By consulting all these sources members of the project team are satisfied that the overview of costs given in Example 2 is a good forecast of the costs which will be incurred if the project is completed under the public procurement option.

2a.3 Operating costs

Operating costs are all the costs incurred during operation and maintenance. The estimates of these costs are based on experience and they should be indexed as they would be in bids. Document all the assumptions you make here in an appendix so that you can quickly find out how particular amounts were calculated and how these may be changed later.

Operating costs can be further subdivided into operational costs and maintenance costs. The maintenance costs are all investment and upkeep costs incurred after competition during the complete life cycle of the project.
Examples of maintenance costs are:
- reinvestments;
- replacement investments;
- running costs.

As you can see from this list, the most important difference between the realisation costs and the exploitation costs is the point in time at which they are incurred.
Operational costs are incurred during the life cycle of the project in order to provide the service. The nature of these costs depends on the project. Examples of operational costs are:
- personnel costs once the project is operational, including social security payments, pension contributions and other direct personnel costs;
- recruitment, education and training costs;
- the cost of raw materials and consumables;
- management and control costs once the project is operational;
- the administrative overhead for project management and the management of assets during the entire life cycle of the project;
- insurance costs once the project is operational.

Sometimes it is not necessary to estimate the costs separately. You can often get an all-in tariff for cleaning services and maintenance of the project. It is also possible that the operational costs and the costs for upkeep of the project partly overlap. In that case it is advisable to integrate the lists of maintenance and operational costs.

Example

Step 2a3: operating costs

Example 3 shows the list of exploitation costs which Taske Streefman and the PSC team have finally drawn up. Besides consulting the sources already mentioned they have also had contacts with various project leaders. However because there is still little experience of the management of operating costs over a long period, Taske has had contact with experts from public authorities and private companies in other countries, in particular in Australia and the United Kingdom where there is more experience of PPP projects.
By consulting all of these sources members of the PSC team are satisfied that the overview of costs given in Example 3 are a good forecast of the operating costs that will be incurred if the project is completed under the public procurement option. There is full documentation to support the estimates in Example 3 so that the estimates can be verified at any time.

Step 2b: define the income

When you begin to estimate costs, you should also start to develop an overview of the income which would arise in the public procurement option. This manual distinguishes between income from sale or rental and income which arises from the residual value of the project. As for costs, there are three steps involved and at each step you should provide an overview and an explanation (see Step 2a).

Output

Overview of all income items:

- income from sale or rental;
- income based on the residual value.

Appendix to substantiate the income forecast.

In the overview of possible income items you only include those income items which would normally occur in the public procurement option. Other conceivable sources of income are not relevant here.

In the PSC calculation you only include income based on the previously agreed output specification. Furthermore only include income from sale or rental in the PSC if this has already been provided for and is likely to arise in the public procurement option. For example, by comparison with income from similar public procurement projects.

2b.1 Income from sale or rental

It is possible that in the public procurement option surplus assets, such as land or buildings, can be sold or rented to third parties. This income is included in the overview of income. In property development projects (for example a school, hospital, or prison) this is in fact the most important source of income.

Example

Step 2b1: income from sale or rental

Taske Streefman consults two (external) estate agents and experts from RWS and the Government Buildings Service. Based on their advice Taske calculates that the sale of excess land could result in about € 1.2 million income. This land is necessary during the construction period for temporary storage, but can later be used for commercial purposes. The PSC team also calculates that from the moment the tunnel is operational there will be an annual income of about € 250,000 from the rental of 1200 m^2 to the traffic control service in the newly constructed tunnel. Example 4 shows this income.

2b.2 Income based on residual value

The residual value is only relevant if the residual value differs between the PPP and public procurement options. In all other cases the residual value is not included in the PSC.

Example

Step 2b2: income based on residual value

The PSC team have had lengthy discussions about the residual value of the road and the security systems. The output specification states that the road, including all accompanying systems and which meet the defined quality requirements, will be handed over to the public authority at no cost at the end of the contract. Taske Streefman therefore concludes that there can be no significant difference in residual value between the two procurement options and this is the reason why Taske does not include the residual value in the PSC.

Step 2c: calculate the crude PSC

All of the costs and income for the crude PSC have been defined in the previous steps. The crude PSC can now be calculated as:

> Crude PSC = Transaction costs + Realisation costs + Exploitation costs – Income

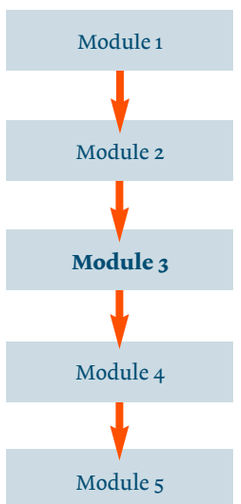
Example

Step 2c: calculate the crude PSC

By summarising all the previous examples in Example 5 Taske obtains an aggregated cash flow chart for the project (excluding the valuation of the risks). Taske has now drawn up the crude PSC.

Module 3:
Risk analysis

3



Step 3a: determine what constitutes a risk
Step 3b: value the pure risks
Step 3c: value the spread risks, subdivided into:
- technical spread risks
- market related spread risks

In the previous module you have identified and valued the costs and income for the project. The costs were subdivided into the three chronological parts of the project:
- transaction;
- realisation;
- exploitation.

In this module this previous subdivision is retained for the identification and valuation of risks during the risk analysis. But there is an extra complication, because we have to distinguish between two types of risk. Appendix B contains an explanation of the theory behind risk analysis as used in this manual. This module helps you to maintain an overview of the steps to be taken for the risk analysis, it advises to what extent the PSC team should call in specialists and experts and indicates how the PPP Knowledge Centre can assist you.

Purpose
The purpose of this module is to include all of the project risks in the cash flow chart and the discount rate applied to the project.

Structure
This module provides you with insight into the types of risk that can occur during the project and with an understanding of the methods which you need to use to value them.

Preparation
In this module you use information gathered earlier:
- the risk analysis you used to allocate the risks;
- the PPC;
- the detailed cost overview from the previous module.

As for the crude PSC, make a plan before you start. Describe here how you plan to verify the risks and document your sources for all of the valuations.

Output
You should be able to create and refine the risk analysis in a period of four to eight weeks. The actual time required will depend on the project complexity and the quality of the earlier analysis.

The output of the PSC risk analysis phase consists of three parts:
- determining the risks;
- valuing the pure risks;
- valuing the spread risks.

Step 3a: determine the risks

Using the risk analysis and the allocation of risks made earlier you now follow the first three steps as described in Appendix B.
- create a list of all possible risks for the project, including risks associated with expenditure as well as income;
- group the risks into categories based on the chronological sequence of the project in order to avoid counting risks twice;
- review the list of allocated risks and select the most important ones.

In preparing for this step, consult existing risk analysis reports made within your organisation or other risk analysis reports available from the PPP Knowledge Centre. A specific working group is usually created for the risk analysis. Of course the specialists in your PSC team are important here. But it is also useful to invite representatives from the decision-makers and those with influence over the project to take part in the risk analysis working group. This will ensure that the people taking the final decision feel involved in the process from the outset and that they are well-informed.

The amount of work involved for the risk analysis working group will depend on the complexity of the project. A risk expert can help you to define the risks and to work through the method. The expert will also help to process the results. You will be able to work more efficiently in the following phase because at this point you select the most important risks.

Example

Step 3a: determine the risks

Taske Streefman realises that the quality of the risk analysis will have a considerable influence on the quality of the PSC as a whole. She therefore organises two workshops. One workshop, primarily aimed at members of the PSC team, discusses the methods for risk valuation. For the organisation of this workshop Taske seeks support from PPP specialists from within the RWS Construction Services Department and from the PPP Knowledge Centre. During the workshop they discuss the methods for risk valuation and help members of the team to understand and use the new material.

The second workshop focuses on finalising the list of relevant risks. With the help of two experienced risk experts leading the workshop members of the PSC team and the various financial, legal and technical experts who were also invited, are able to identify all possible risks for the project. The risk experts use brainstorming techniques, checklists and experience from reference projects.

The workshop results in a summary of nine risks. At the end of the workshop Taske categorizes the risks and divides them over the phases of the project: the transaction phase, the realisation phase and exploitation phase. Diagram 3 shows a summary of the results of the risk inventory.

Diagram 3: Step 3a determine the risks

Using the risk analysis Taske Streefman defines nine risks which she then divides into the three risk categories defined earlier.

Risk	Risk Description	Example	Risk category
Risk of unfavourable results of bidding process	Risk of unfavourable results bidding process	Few bidders therefore high prices	Transaction risk
Design risk	Probability of gaps in the design	Inadequate lighting	Realisation risk
Risk of unfavourable ground and soil conditions	Probability of unfavourable ground and soil conditions	Archaeological finding	
Risk of extra costs during realisation phase	Probability of large accident	Damage to works	
Risk of extra costs during realisation phase	Probability of flooding	Inundations of works	
Risk of extra costs during realisation phase	Probability of protest demonstrations	Environmental protests that interrupt the works	
Technical risk	Probability of problems with piling	Ground conditions differ from trial results	
Risk of extra costs during exploitation phase	Probability of supplementary security requirements	Law requiring additional safety measures.	Exploitation risk
Risk of extra costs during exploitation phase	Replacement investment sooner than planned	Faster deterioration of asphalt road surface	

Step 3b: value the pure risks

Pure risks are special incidents, occurring during one of the project phases, which have a negative effect on the expected value of the net costs and income for the project.

Appendix B defines several steps for this phase. The most important steps are:

- estimate the size or impact of the risk;
- estimate the probability that the risk will occur;
- create the risk matrix;
- value the pure risks.

The probability that pure risks will occur and the associated financial consequences can be estimated by specialists. For example, the possibility that archaeological remains will be found which will subsequently delay the construction of the road. The value of such a risk is equal to the chance that it will occur (based on experience) multiplied by the financial consequences should it occur.

The PSC team can also use risk estimates from previous projects. Remember that the interpretation of these estimates, the correlations between risks, and adjustments for the specific circumstances of this particular project requires a lot of experience. Risk valuation is specialist work. Knowing that reputable and well-established specialists have been involved in the risk valuation seems to have been very important to decision-makers in other projects.

Of course this manual is not a training course on 'how do I value risk'; it only gives an introduction to the subject. It is important to involve specialists. You can use the following sources to obtain more information and expertise about pure risks:

- experienced project managers who have participated in similar projects;
- information contained in original tender documents, risk matrices, audits and other project evaluations;
- sometimes an insurance premium, based on a 'market price' (determined by an insurance expert) can provide a complete valuation of a specific risk and simplify the valuation in the PSC;
- information from rating agencies on risks with similar projects.

Sometimes even the specialists cannot agree about the valuation of a risk. In such cases your best course of action is to consult another specialist for a second opinion. During the preparation for this module you made a plan stating how you will verify the risks. You have also documented the sources of the estimated values in an appendix to your report. Any differences of opinion between the experts should also be documented in the same appendix.

Diagram 4: Step 3b valuation of pure risks

Together with the PSC team Taske assesses the risk inventory. Six pure risks remain. For each pure risk, the best possible evidence is sought for the probability of the risk occurring and the effect it will have on the cash flow should it happen. Taske and the members of the PSC team consult evaluation reports drawn up by audit departments and the National Audit Office, as well as estimates made by experts (from RWS and two external experts). In the end Taske values the risks by multiplying together the expected size of the risk (effect on the operational cash flow) and the probability that the risk will occur:

Example 6 List of pure risks

risk category	size	probability	effect	correction on
1. risk of unfavourable results bidding process	13,000,000	33.30%	4,329,000	transaction
2. unfavourable ground and soil conditions	5,000,000	5.00%	250,000	realisation
3. design risk	500,000	2.50%	12,500	realisation
4. risk of extra costs during realisation phase	55,500,000	15.00%	8,325,000	realisation
5. technical risk piling techniques	5,120,000	25.00%	1,280,000	realisation
6. risk of extra costs during exploitation phase	8,300,000	25.00%	2,075,000	exploitation
total valuation of the risks			16,271,500	

Taske then gives an overview of the cash-flows including the valuation of the pure risks. See Example 7.

Step 3c: the valuation of the spread risks

As discussed above, this manual distinguishes between technical spread risks and market-related spread risks. Spread risks can form a substantial part of the total PSC benchmark. Appendix B describes methods for calculating the spread risks. We recommend that you engage experts to calculate both types of spread risk.

Technical spread risks

You value the technical spread risks by estimating the probability that an item of income or expenditure will turn out to be higher or lower than the estimate due to technical circumstances and limitations. As for the pure risks, the value of the spread risks is incorporated into the cash-flows. An example of a technical spread risk is the risk that weather conditions during the construction process will delay construction so that the cost of construction will deviate considerably from the estimate.

Market-related spread risks

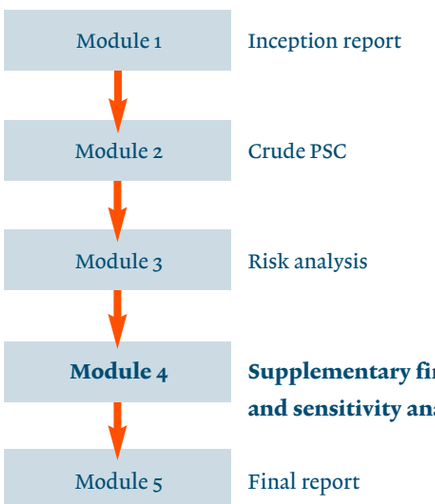
You value market-related spread risks by estimating the probability that the expected expenditure will turn out to be higher or lower than the estimates due to market-related circumstances such as the macro-economic situation, developments in the project sector or the quality of the management. The value of the market-related spread risks is incorporated into the projects discount factor. An example is when the price of oil fluctuates greatly or when management functions poorly.
NB: For an explanation of the terms 'cash flow' and 'discount rate' please refer to Module 5 and Appendix A.

Example Step 3c: the valuation of the spread risks

You can read more about the way in which Taske values the spread risks with her external experts in Appendix 2, Paragraphs 5 and 6. The result of this analysis is shown in Example 8. Taske values the spread risks at € 19.2 million. This example only provides part of the total calculation of the spread risks. For the purpose of simplyfing the example, only uncertainty regarding the costs has been valued. When preparing the PSC one has to take the uncertainty of expected revenues, income into account as well. In order to value the spread risk it may be necessary to obtain the assistance of specialists such as the PPS Knowledge Centre.

Module 4: Supplementary financial considerations and sensitivity analysis

4



Step 4a: identify and analyse supplementary costs and income
Step 4b: identify and analyse the impact of different assumptions and variables (sensitivity analysis)

Purpose

The purpose of this module is to supplement the financial comparison with factors which are relevant to the PSC but which are not included in the cash flow chart or in the discount rate for the PSC net present value calculation.

Structure

In this module we first explain that some costs and income can result in a distortion in the PSC comparison. Then we explain the steps that the PSC team should take to deal with these distorting factors. The second part of the module checks whether the calculated value of the PSC, which consists of the crude PSC, the risks and the quantified supplementary items, is robust. If the calculation is not robust then some further advice is given.

Preparation

The identification and analysis of supplementary items and the sensitivity in this model is related to the work carried out in Modules 2 and 3. This means that while you are working on Modules 2 and 3, you can anticipate what needs to be done in Module 4.

Output

It normally takes about four weeks to formulate the supplementary costs and income and to carry out the sensitivity analysis.

Step 4a: identify and analyse supplementary costs and income

To identify all the supplementary factors you must consider which elements of the private bid contribute to the realisation or exploitation costs but which are not included in the crude PSC and in the risk analysis (Modules 2 and 3). These items will have an influence on the financial comparison of the bids and the public procurement option.

When you have identified these factors you analyse them in two steps:

- does the identified cost or income have a distorting effect on the comparison between the public and PPP procurement option? In other words, the pure cost comparison turns out to be other than expected (disadvantageous) at the project level due to taxes, penalty clauses, etc. (see examples below). If the item does have a distorting effect then you must give an explanation. You then go on to the second step.
- can you quantify the effect? If there is a distortion but it cannot be quantified in the comparison, then the factor is treated as a supplementary financial consideration in the PSC report. If the item is quantifiable, then you decide together with the rest of the PSC team whether the amount should be incorporated into the cash flow chart or that it should be included in the PSC report as an extra consideration.

In this manual we have identified seven supplementary financial factors and each of these is analysed using the steps mentioned above.

4a.1 VAT

As mentioned earlier, the PSC considers the total costs and income for the commissioning authority. If the Government is the commissioning authority, as is the case for government projects, then the commissioning authority is automatically compensated for VAT payments by the collection of VAT on its own invoices. The situation is different if another public body or regional government is the commissioning authority. Whether VAT then leads to a distortion in the PSC depends on several factors, for example:

- if a public party, in a public procurement option, commissions large quantities of work from other public organisations which are not registered for VAT, then in the public procurement option no VAT is levied on the labour costs. In the PPP procurement option VAT must be charged for these labour costs. There is therefore a distortion.
- for sizeable initial investments the private party will have to prefinance a considerable VAT payment. Depending on the agreements made with the Tax Department, the private party may only be able to reclaim the VAT payment over a period of several years.

This results in a clear distortion of the regular cash flow pattern.
In situations where the payment of VAT causes a distortion in the PSC cash flow, then you must analyse the VAT according to Step 2, as described above. You can include an additional consideration in the PSC Final report explaining that the PPP development would be more advantageous if:

- the commissioning authority would decide to do less of the work themselves and thus draw an advantage from the status of not being VAT-registered;
- an agreement can be made with the Tax Department that the VAT payments will be spread evenly over the duration of the project.

NB: In 2003 a VAT compensation fund will be established in the Netherlands to compensate local and regional government for the burden of VAT. It is expected that VAT will then cause less distortion in these circumstances.

Example

Step 4a1: VAT

A local authority is project manager for a construction project which includes the design, construction and maintenance and management of a building, and for this work invoices from third parties include VAT. The invoices which the local authority receives from within its own organisation, for example the civil engineering department, do not include VAT.
Suppose now that the local authority is constructing a building whereby € 3,000,000 is spent on the purchase of materials. Including 19% VAT this would be € 3,570,000. The work carried out by the internal civil engineers amounts to another € 3,000,000. There is no VAT to be paid on this amount. In total the commissioning authority spends € 6,570,000 for the realisation of the building.
If the commission for the construction of the building was given to a private party the picture would be different. Because of economies of scale, the private party pays less for the purchase of materials € 2,900,000, the private party is also more efficient and the civil engineering costs are only € 2,800,000. The total costs for the private party are thus € 300,000 lower. The private party invoices the local authority for the realisation of the building € 5,700,000 excluding VAT. The local authority receives final invoice for a total of € 6,764,000 including VAT and this is more than if the authority were to manage the work themselves.

In this example VAT has a distorting effect. Taske decides, together with her team, that they will include a supplementary consideration in the PSC report that VAT has had a significant effect on the comparison of total costs and that VAT on the use of internal civil engineering services biases the decision in favour internal management of the construction.

4a.2 Corporation Tax

According to the analysis described in the first step you only include corporation tax in your considerations if it has a distorting effect on the project cash flow. In the public approach the individual companies pay corporation tax. A true comparison is not possible if you assume that the corporation tax liable from the consortium in the PPP procurement option would be more than the corporation tax liable from the individual companies in the public procurement option. However this might be the case if the analysis shows that the PPP procurement option has a higher added value.

Example

Step 4a2: corporation tax

A public authority requests tenders for the design, construction, management and financing of a prison. The total expected corporation tax liable by the Special Purpose Vehicle, set up specially for this purpose, and their subcontractors amounts to € 2.5 million. This amount is almost the same as the amount that the subcontractors would pay on their profits in the public procurement option. Thus, in this case there is no distortion.

4a.3 Cost of (short-term) availability

Even though earlier or higher availability of a project can result in greater public benefits, from a financial point of view this may result in extra costs. Delayed availability may mean, for example, that

the public authority incurs costs at a later point in time, and is therefore better off .

In the PSC you value the timely availability of the service only if:
- the agreed contract with third parties includes a penalty clause for delayed availability or a bonus if the project is completed ahead of time;
- even with exactly the same output specifications, the completion date will differ because the private party will be incentivised by the bonus and penalty clauses to complete the work on time.

NB: The bonus and penalty clauses are not necessarily the only incentives.

Using the two-step analysis, the PSC team must first decide whether this cost is relevant for the project and then they should see if it is quantifiable and where the adjustment should be placed.

Example

Step 4a3: cost of (short-term) availability

At completion we are concerned with the quality and timing. Taske Streefman and her team have included in the project specifications for the A101/A18 link road a required availability of 99% between 06:00 and 20:00 hours, and outside these times an availability of 90% from 01-01-2008. However, in the case of the public procurement option, there is a greater chance that this date will not be met and that the availability will be lower than the required percentages. Needless to say, RWS will not impose penalties on itself for delayed completion. Only if there was an agreement with the companies on the industrial estate near the A101 that the road would be ready by 01-01-2008 otherwise compensation would be payable would it be correct to include this risk in the PSC.

4a.4 The cost of re-tendering the contract

As commissioning authority you can decide to reject all of the private bids because they did not demonstrate good value. The possible costs of issuing a new tender invitation for the project fall into the direct and indirect miscellaneous costs category.

Direct costs include the cost of internal project management and all other costs which are incurred in the public procurement of the project. For example, the cost of creating the detailed specification drawings. Although these direct costs are similar to the transaction costs which we discussed in Module 2, the re-tendering costs do not typically apply for the public procurement option whereas the transaction costs do.
The cost of re-tendering the contract is only relevant for the final comparison if you have to make a choice between the public and PPP procurement options.

Indirect costs are incurred as a result of the delay which re-tendering causes, and the possible damage to your credibility. Rejecting private bids may have the long term effect that, in future, private parties will be less interested in bidding.

For the PSC you calculate the direct and indirect costs of re-tendering the project, and you explain these costs. There is no direct comparison for these costs in the PSC, but they could tip the balance in the final evaluation. There is little experience on which to base an estimate of the size of these costs. When the results of step two of the analysis are available, the PSC team must decide whether to place these costs in the cash flow chart or to include them as a separate consideration in the Final report.

Example

Step 4a4: the cost of re-tendering the contract

Taske Streefman calculates that the costs of re-tendering the contract for the A101/A18 project can be separated into delay (reissuing the invitation to tender will require an extra four months), the deployment of extra manpower to complete various procedures (1000 man hours at an average cost of € 225 per hour) and extra preparation costs for the specification drawings and engineering (5000 man hours at an average cost of € 250 per hour). The total estimate is € 850,000.

In the second step the analysis, the PSC team decides whether these costs will be included in the Final report as a separate consideration.

4a.5 Valuation of the certainty of fixed project costs

When a private bid is accepted it results in a degree of certainty concerning the total cost of the project. The valuation of this will differ per commissioning authority and on the valuation of the spread risks. Generally speaking, some variability in the valuation of the spread risks may be acceptable. For example, the probability that the budget is exceeded can be reduced from 50% to 16% (see the discussion about technical spread risks in Appendix B).

The probability that the budget will be exceeded disappears when a private bid is accepted, and at the same time there is no longer a possibility that the risks will turn out to be lower than expected. This factor can be compared to a guarantee limiting the amount by which a budget can be exceeded and it increases the PSC.

4a.6 Possible income if the project is refinanced

Generally speaking the risk profile, which embraces mainly the design and construction risks, changes over time. Some risks are no longer relevant and therefore the cost of funding the project is often lower. The original cost of funding project was based on the high risk profile at the point in time when the loans were agreed with the banks.

By making careful agreements in advance, this income created by the private parties, can also benefit the public party to some extent. This potential income can be valued as a call-option. Experience shows that almost all projects are refinanced shortly after the close of the construction period, even when the call-option has a low cost, indicating that refinancing is not particularly interesting for the shareholders.
The possibility of refinancing can also be an argument for reducing the discount rate below that derived by the cost of capital method. You may also decide to deduct the potential income obtained from refinancing the project from the value of the private bid instead of adding it to the value of the PSC.

4a.7 Cost of monitoring project during the PPP

The costs which the commissioning authority incurs in monitoring the PPP project are of a different order to the costs which would be incurred in the case of a public procurement. As for refinancing costs, these are potential costs, and are not therefore a direct part of the PSC. The PSC team must use the two-step analysis to decide what to do with these costs.
As with the income generated by refinancing the project, you can also decide to add these costs to the private bid instead of deducting them from the PSC.

Step 4b: identify and analyse the impact of different assumptions and variables (sensitivity analysis)

Your PSC model now consists of the costs, income and risk valuation and you understand several supplementary factors for the final comparison.

The next step is to calculate the impact on the PSC as your assumptions are varied and take into account fluctuations in prices. By varying these factors you will understand the importance of some of the assumptions and the possible changes to the model. This is known as sensitivity and analysis and its main purpose is to check the consistency of the PSC value.
Furthermore the sensitivity analysis helps you to gain insight into:

- the degree of uncertainty hidden in the risk analysis;
- the comparison between private bids which are based on different assumptions.

During the risk analysis you valued the technical spread risks for variations in specific prices and the market-related spread risks for different macro-economic assumptions (see Module 3). If these are significant risks, we would expect the sensitivity analysis to confirm this.

4b.1 Core sensitivities

Some assumptions have significant consequences in the final cost and income estimates. It is important to mention these core sensitivities separately. Examples of core sensitivities are the assumptions made concerning the length of the project, the realisation costs, the operational costs, the renewal of technology, fluctuations in exchange rates and energy prices and changes in the lifecycle of a particular business sector.

Example

Step 4b1: core sensitivities

Taske and her team refer to two core sensitivities in the realisation costs which have a considerable influence on the results of the PSC. These are the price of:

- asphalt (45 percent of the cost of the constructing the road);
- concrete (25 percent of the cost of constructing the tunnel).

By analysing these prices the team learns that they can fluctuate considerably. According to Taske it is desirable to calculate an optimistic and pessimistic case and to interpret the results to be able to analyse the influence this has on the core sensitivities. Taske assesses the effect of price variations from + or – 30%.

Price of asphalt per m^2 = € 2000 **Requirement = 19500 m^2**		**Price of concrete per m^3 = € 100** **Requirement = 285.000 m^3**	
Price asphalt	+/- 10%	+/- 20%	+ /- 30%
€ 39,000,000	€ 3,900,000	€ 7,800,000	€ 11,700,000
Price concrete			
€ 28,500,000	€ 2,850,000	€ 5,700,000	€ 8,550,000

Based on the sensitivity calculations Taske concludes that the PSC calculations are highly sensitive to variations in the prices of asphalt and concrete.

4b.2 Managing the sensitivities in the PSC model

It may be that the results of the sensitivity analysis mean that the value of the PSC differs considerably when some assumptions are changed. In this case there are three possibilities:

- you obtain a second opinion for the selected assumptions. If these assumptions are confirmed, then this can be explained as a reduced spread for this assumption and thus, less uncertainty.
- you study the model together with experts to see if it can be adjusted so that it is less dependent on the uncertain assumptions. Be careful to maintain the reality of the model.
- you introduce different scenarios, for example: a pessimistic case with a probability of 35 to 45%, a neutral case (the original estimate) with a probability of 40 to 50% and an optimistic case with a probability of 15%. The final value of the PSC is then the weighted average of the three possible results.

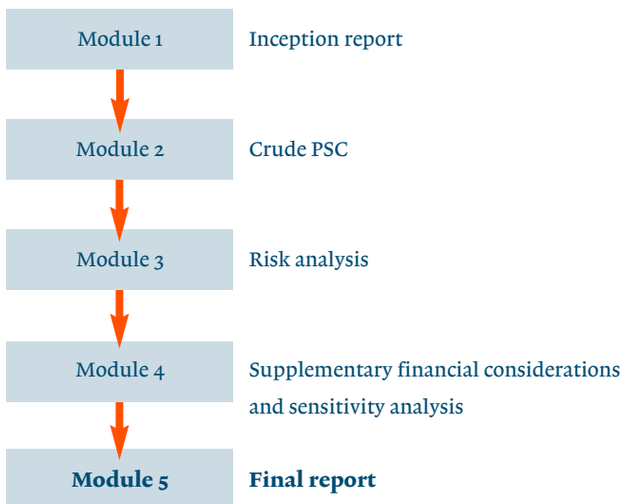
Example

Step 4b2: managing the sensitivities in the PSC model

The sensitivity analysis confirmed the idea which Taske already had, namely that the price of asphalt and concrete have a substantial influence on PSC. Taske engages an independent specialist to investigate what the most probable price range will be for concrete and asphalt. The highest, lowest, and average of the two price ranges are used in the calculations. Based on the calculations for each of the three cases Taske calculates the weighted average which she then uses for the PSC calculation.

Module 5: Final report

5



Step 5a: calculate the present value of the PSC
Step 5b: describe the results
Step 5c: PSC confidentiality
Step 5d: comparison with private bid
Step 5e: management summary and decisionmaking

In this last module you first calculate the present value of the PSC by discounting the costs and income calculated in the earlier modules. Your Final report then shows the results and the accompanying analysis, which explains the content as well as the process followed.

Purpose

The purpose of this module is to substantiate the total public cost of the project, which consists of the parts described in the previous modules. You are then in a position to compare this amount to the private bids.

Structure

This module first explains how to calculate the present value of the amounts included in the PSC. Then you have the total PSC value and a good understanding of the costs, income and risks involved and any supplementary considerations which you may or may not have quantified. The specialists in the PSC team have almost finished their work. The project leader is now responsible for the Final report which should be drawn up in consultation with the decision-makers from within and outside the PSC team.

Preparation

The value of the PSC as calculated earlier and the calculation of its present value is a logical sequel to the work already done. In the Final report you document the results of the first four modules.

Output

You can expect to complete the steps in this module within four to six weeks, and this module will result in:

- the result of the PSC; the present value calculation for the reference project, including the valuation of risks and supplementary financial considerations.
- any refinements made to the PSC during the procurement up to the final private bid.
- the approach the PSC team has taken concerning the confidentiality of the document.
- a description of how the PSC should be used in the comparison with the private bid.
- a management summary and recommendations for the procurement decision and further actions.

Step 5a: calculate the present value of the PSC

In the previous modules, parts of the PSC were described and quantified as far as possible.

> Total PSC = crude PSC + risks + supplementary cost and income amounts

This calculation is only correct if the timing of the costs and income are taken into account . Money spent now has a different value to money spent in two years time. To calculate the net present value, the following three steps should be carried out:

1. costs and income are placed in a cash flow chart and netted;
2. the net amounts are discounted;
3. the net present value is calculated

For 1. Costs and income are placed in a cash flow chart and netted

When calculating the amounts in the previous paragraphs you already took the timing of the costs an income into account. The first step is to create a spreadsheet with all the costs and income for the entire project in such a way that you can add up the costs and deduct the income for each year. Your spreadsheet now contains a list of values per year.

For 2. The net amounts are discounted

Discounting takes into account the reduced value of money due to inflation, timing and risk.

The discount rate reflects the cost of borrowing. The discount rate applied to government projects therefore follows the rules set out by the Ministry of Finance and currently is the same as the nominal

interest on government bonds for a similar period as the duration of the project. Although this approach is based on the direct cost of capital, the discount method does not fully take into account the market related spread risks to which the project is exposed. A surcharge on the nominal interest rate is calculated to take this into account.

In order to conform to the Ministry of Finance rules you must therefore estimate the surcharge for the market-related spread risks according to the benchmark and cost of capital rate method described in Appendix B, and then incorporate these values into the cash flow chart.

For non-governmental projects the market-related spread risk is incorporated into the discount rate as a surcharge to the risk-free interest rate.

The private bids calculate a similar discount rate in the same way. You need to use discount rates which are more or less comparable for your final comparison between the public option and PPP bid.

For 3. The net present value is calculated

Taking the timing and values of expenditure and income into account means that you need to calculate the present value of the PSC. You do this in several steps:

- all costs, income and risks have been valued in Step 1 at current prices or at values which would apply in year 0;
- if there is income in the same year, then this is deducted from the costs in that year, in Step 1;
- the balance of the costs and income is indexed annually for inflation. The PPP Knowledge Centre's financial advisor can assist you in determining the correct indexing percentage. By indexing the cash flow you can use the nominal discount rate in the following step;
- discount the balance for each year using the nominal discount rate;
- you can now calculate the present value for this year and subsequent years by adding the value for this year to the discounted amounts for the following years (see explanation).

The formula to calculate the present value is as follows:

$$PV = \sum_{t=0}^{n} \frac{C(t)}{(1+d)^t}$$

PV = *the present value*
n = *the number of project years*
C(t) = *the balance of costs and income in the year t, indexed for year t.*
d = *the discount rate (percentage)*
t = *year*

For a project with € 100 costs in year 0 and € 100 in year 1, with a discount rate of 6% and indexing for inflation at 2% per annum, then the net present value (or NPV) of the project is: 100 + 102/1.06 = 196

Example

Step 5a: calculate the present value of the PSC

Taske Streefman creates a comprehensive cash flow chart using the various examples containing costs and income for the project. She has summarized all the costs and income including the valuation of the pure risks in example 9. Taske arrives at a net present value of € 284.6 million, assuming a discount rate of 6%.

Step 5b: describe the results

The PSC results can be divided into two parts:

- the sum in present value terms of the firm costs and risk valuation less any income;
- a number of supplementary financial considerations, which are not necessarily quantifiable.

Example

Step 5b: describe the result

Taske describes the results of the PSC in two related parts:

1 The sum of the firm costs and risk surcharges less any income:
   - converted to present values for the duration of the project contract is € 284.6 million (= NPV public procurement option).

2 Aanvullende posten
   - if the a private bid will not be accepted, the costs of re-issuing the invitation to tender add € 850.000 to the total cost of the public procurement option.
   - VAT distorts the comparison of the public approach with the bids. For this reason VAT has been omitted from the comparative figures. The realisation phase in the public procurement option will be cheaper since no VAT is due on the costs of the public civil engineers.

Step 5c: PSC confidentiality

The PPP Knowledge Centre recommends that the detailed description and results of the PSC should remain confidential and not be made public, neither to the bidders nor to other interested parties. Only when a selection has been made of the most favourable procurement option should information on which approach was cheaper and its added value be made public.Two reasons for this confidentiality are:

- the value of the PSC can change up to the final negotiations with the (preferred) private bidder. Knowledge of the value of the PSC during the procurement would probably give the bidder a false picture.
- the PSC is an instrument to stimulate competition and innovation among the private parties. Experience shows that the PSC can be used during negotiations to give more competitive bids.

In practice, the private parties will have a reasonable idea of the value of the PSC:

- experience gained in previous projects provides insight into the breakdown of design, construction and maintenance costs;
- the public commissioning authorities' budgets are public and these also provide insight into the expected costs of the project in the short-term.

An exception to this rule can be made only if, after market research, it becomes apparent that there is no private interest in bidding whilst the value of the PSC is not made public. The PPP Knowledge Centre can advise you in this matter.

Step 5d: comparison with final private bid

The PSC benchmark is set up at the start of the procurement. During this process the benchmark is adjusted, according to the Change Protocol. The final version of the PSC can be calculated on receipt of the final private bid. This is the PSC which is compared with the private bid.

Your aim here is to determine whether the PPP procurement option is better value than the public procurement option. Better value, as defined in the Introduction, means that the same quality is purchased for a lower price, or that the same price is paid for better quality.

Note! The better value described in this manual is always financial added value; the PSC cannot pretend to weigh up all the pros and cons of the public and PPP procurement options.

Figure 1 shows the comparison between the public and two PPP procurement options. Using this figure, but excluding unquantifiable supplementary factors, you can determine whether the private bids offer better value or not.

Figure 1: Comparison between public and PPP approach

Figure 1 is a simplification of the comparison. In actual fact, the comparison of the PSC with the private bid is rather complicated. There may be differences in the assumptions made and in the discount rate used as explained above. If the assumptions made in the private bid differ from the assumptions made in the PSC then there are two possibilities:

- you can revalue the private bid using the assumptions you used in the PSC;
- you can change the PSC to reflect the assumptions made in the private bid, under the conditions described in the change protocol for the PSC in Module 1.

A combination of the above is also possible. Another difference lies in the way in which payments are made by the public commissioning authority. In the public procurement option the costs for the design and construction are paid directly upon completion, or earlier. In the PPP procurement option, the private bidder supplies a service for the total duration of the contract. Your payments are spread over the duration of the contract and then only if the service supplied meets the quality requirements.

To make proper a comparison you must also express the private bid in terms of net present values. You assume the same start date (year 0) and take into account the differences in assumptions and discount rate discussed above. The PPP Knowledge Centre and other financial advisers can help you at this point.

Step 5e: management summary and decision

The last part of the Final report is the Management Summary which contains the recommendations made by the PSC team for the subsequent decision. It is common practice to print this part on coloured paper and place it at the front of the report.

Depending on the current phase of the procurement, you can include a comparison with the private bid or make recommendations concerning the next steps to be taken. As we mentioned in the Introduction there are two extreme variants of the PSC benchmark:

1. The PSC at the initial stages of the procurement, before any tenders have been received.
2. The PSC at the stage where definition of the scope, risk allocation and output specification have been finalised.

For 1. The PSC at the initial stages of the procurement, before any tenders have been received.

For the PSC as formulated at the beginning of the procurement the management summary should contain:

- the relationship with the PPC report which was made earlier;
- a brief description of how this document was drawn up;
- tables indicating the structure of the public procurement option;
- the list of supplementary financial considerations.

Finally, the PSC team can inform the decision-makers of the progress of the PPP procurement now that the PSC is complete. Examples of advice at this stage are:

- the necessity of revising the PPP procurement;
- the expected adjustments in the PSC during the rest of the procurement;
- the valuation of mark-ups in the private bids in order to make a better comparison;
- the PSC as an instrument in the subsequent negotiations with private bidders.

For 2. The PSC at the stage where definition of the scope, risk allocation and output specification have been finalised.

Your management summary in the final version of the PSC which is based on the definite scope, risk allocation and output specification and which will be more extensive than in your initial PSC report. Besides the explanation and the supplementary financial considerations the PSC team should make recommendations to the decision-makers on the following:

- the presentation of the private bid, in tabular form, with the conclusion as to which option is recommended;
- the context of the PSC and the other non-financial arguments which contribute to the final decision. Are these arguments consistent with the result of the PSC?;
- a proposal for the subsequent decisions to be made;
- a proposal for the evaluation of the PSC process.

Appendix

A

Appendix A: glossary

Term	Description
Added value	Added value, also 'value for money' means higher quality for the same money or the same quality for less money.
Ancillary revenues	Additional income generated by the project which was not part of the original specification.
Awarding	The project is awarded to the company whose bid scores best against the predefined award criteria. (See also specifications).
Call for tenders	Public procedure, which can be audited, whereby companies are given the opportunity to submit a tender for the product or service to be provided.
Cash flow	Costs, income and risks which together determine the profitability of the project.
CBA	Cost benefit analysis.
Change protocol	Agreement made in advance in which the parties indicate under which circumstances the PSC can be modified and who is authorized to suggest and make changes.
Combination Projects	Projects whereby various forms of cooperation are combined, for example a concession and a joint venture.
Concession	The exclusive right granted to a commercial organisation to exploit a specific project for a defined period of time.
Construction team	Innovative tender process for DB contracts, whereby public and private parties take joint responsibility for the design and construction.
Cooperation form	Also referred to as a cooperation model: for example innovative tendering (DB), DBF, DBFM, concession, joint venture etc.
DB	Design and Build: design and construction are put out to tender as one project.
DBF	Design, Build and Finance: design, construction and financing are placed in the hands of a private party or a consortium of private parties.

DBFM	Design, Build, Finance and Maintain: design, construction, financing and maintenance are placed in the hands of a private party or a consortium of private parties.
DBFMO	Design, Build, Finance, Maintain and Operate: design, construction, financing, maintenance and operation are placed in the hands of a private party or a consortium of private parties.
Discount rate	The percentage applied to the cash flow to calculate present its value.
Discounting	A method for comparing cash flows by adjusting them for expected inflation and time preferences (and associated risks).
Hidden costs	Hidden costs are costs which are incurred, but which cannot be allocated directly to the project because they are part of the fixed costs or overhead.
Input specifications	Criteria set for the technical realisation of the project.
MIT	Long-term infrastructure and transport plan.
Net present value (NPV)	Costs and revenues of the project are expressed over time and are calculated back to their net present value (NPV). This calculation is called discounting. By discounting all the costs and income for the project the Net Present Value can be calculated.
OEEI	Research programme into the economic effects of infrastructure.
Output specification	Criteria which defined for the functionality to be provided by the project.
PPP	Public Private Partnership, or a form of cooperation whereby public authorities and private parties share responsibilities and risks.
PPP procurement option	The procurement option whereby several elements of a project are integrated into one project, usually based on output specifications to allow for private sector knowledge and innovation.
Public procurement option	Procurement of a part of a project by means of a detailed project definition with input specifications. The financial risks remain almost entirely with the government.
Requirements	A set of requirements defined by the commissioning authority: often very similar to the input specification.
Scope	Extending or reducing the definition of the project; for example; whether or not to include parts the infrastructure.
Specification	Document containing information about the required input; companies draw up their tenders based on this document.
Transaction costs	The costs associated with the development of the initial option studies, tender documents and contract models.

Example Net Present Value (NPV)

A consortium invests an extra € 10 million in an infrastructure projects over a period of three years. Given that the discount rate for this loan is 12 percent, then the current economic value (NPV) of this future investment is: $10{,}000{,}000/(1.12)^3 = 7{,}117{,}800$. The net present value is sometimes referred to as the present value; these are one and the same.

Appendix

B

Appendix B: risk analysis

1. Introduction

Risks form an integral part of every project. In this manual, risks are defined as the uncertainty of the income and expenditure involved in the project, ie the range of possible outcomes. Before the final financial comparison between the public and public-private procurement option can be made you need to understand the kind of risks involved and their size. Risk analysis is the tool to use. Depending on the information available and on the size of the project, you must decide, together with your project team, whether a global analysis is sufficient or whether you need a more detailed analysis.

2. Types of risk

Public authorities base their cost and income budgets largely on estimates which are multiplied by a risk factor for uncertainty in decision-making or knowledge, and for other measurable risks. In addition budgets will usually contain an amount for "project contingency" and an amount for "contingent events" to cover themselves for the consequences of any specific events within the project which cannot be charged to other parties, such as the commissioning authority or an insurer.

Most estimates made by public authorities - such as the estimates made by RWS according to the method for estimating infrastructure projects (PRI) - do not contain all the risks which private parties include in their bids. When drafting a PPC or PSC it is advisable to have a risk analysis available which includes all possible risks. The risk analyses currently available, which were drawn up for DBFO contracts, distinguish between pure risks and spread risks.

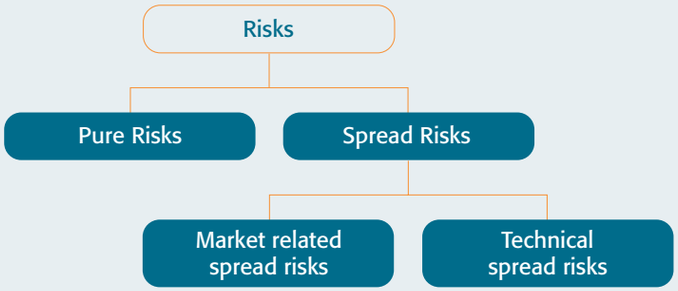
Pure risks

Pure risks are specific events which may occur during the construction or operation and maintenance period and which can have a negative influence on the net balance of the expected revenues and costs of the project. An example is the risk of heavy rain or hail storms which delay construction and which subsequently lead to higher costs. The value of such a risk is calculated as the chance that the event might occur multiplied by the financial consequences should it occur. The valuation of these risks is added to the estimated costs. In this way the pure risks are made visible in the charts containing the expected cash flow.

Spread risks

Spread risks are those risks concerning the uncertainty surrounding the estimated amounts and the pure risks. To a large extent, spread risks are linked to the macro-economy, and to a lesser extent they are also linked to the uncertainty of the technical estimates, or the uncertainty of the estimated prices and quantities. We can therefore consider market-related spread risks and technical spread risks. Experience demonstrates that the market-related spread risks are greater than the technical spread risks.

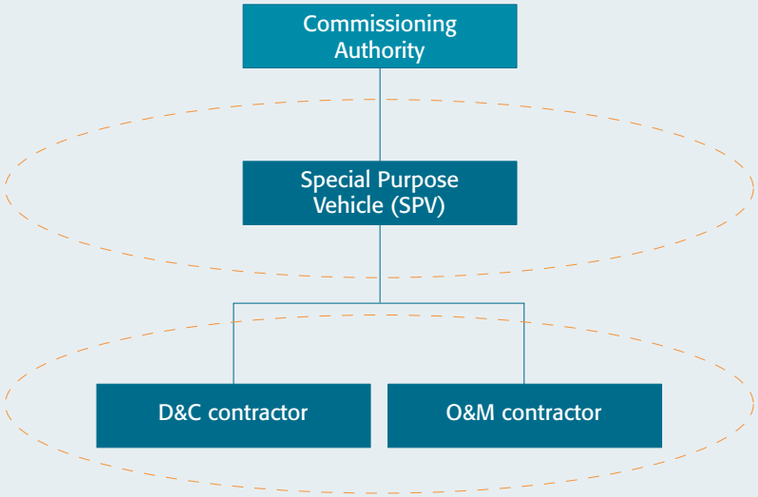
Figure 2: Methodological categorisation of risks



In a DBFM/O construction, a consortium will usually set up a Special Purpose Vehicle (SPV or Special Purpose Company, SPC) which will contract with one or more sub-contractors to realize the project. A further sub-contract with another company may allocate responsibility for the exploitation (maintenance and management) of the project. In these contracts a large proportion of the risks are transferred from the SPV to the contractors, especially those risks related to direct costs.

This primarily relates to the technical spread risks and the pure risks, and to a lesser extent to the market-related spread risks. The SPV bears some of the risks itself, namely those market-related spread risks and some pure risks which are less manageable and therefore less easy to transfer, and which in a public procurement option would largely remain with the commissioning authority.

Figure 3: Market related organisation structure



3. The valuation of risks

There are several ways to calculate the value of risks:
Using the risk matrix, the pure risks can be listed and the corresponding values of these risks can be included in the cash flow chart. Paragraph 4 discusses the construction of the risk matrix in more detail.

The technical spread risks can be valued by using the values in the risk matrix (pure costs) and by calculating other technical risks such as price fluctuation for items such as land and labour which are relevant to the project. An alternative is to use one risk factor for all spread risks together and this value can then be treated as a probability density distribution. The probability that the cost of a particular risk turns out to be higher than the estimate is 50% and in the case of a normal distribution this is the same as the average. If the parties wish to reduce the probability of exceeding the estimated costs then they can take a value in the 84% to 90% range. This means that the value of the technical spread risks is the same as the price difference between the 84% and 50% values.

The market-related spread risks can be valued in two ways: the benchmark method and the cost of capital method. When the benchmark method is used, the risk factor that the financial markets would use for these risks (including the technical spread risks) is determined by studying the risk factors applied to similar projects. When the cost of capital method is used, the factor that the capital markets would apply to the non-insured (business) risks is calculated based on the average yield required for the total project life cycle. By comparing the results of both methods an estimate for the maximum risk factor to be applied to the market-related spread risks can be made. Paragraph 5 discusses this in more detail.

We advise using both methods to provide greater certainty on the outcome. In order to reduce the possibility of miscalculating it is best to use as many different methodes as possible and to compare the results. If the calculation of the same risk is a lot higher or lower by a different method, then the reasons should be investigated. We also recommend using consultants with experience in risk valuation. The PPP Knowledge Centre can provide you with a list of experts in this area (in the public as well as the private sectors).

4. The valuation of the pure risks using the risk matrix

Using the risk matrix you will gain insight into the pure risks related to the project as well as the technical spread risks, for example price variations. In Paragraph 4 of this manual the valuation of pure risks using the risk matrix is discussed. Technical spread risks are discussed in Paragraph 5. This means that price fluctuations are not included in the risk matrix.

The risk matrix is constructed in several steps. The risk matrix should always be used for the valuation of the pure risks. As we discussed earlier the risk matrix can also be used to calculate the value of individual spread risks.

The sequence of the steps to be taken when constructing the risk matrix is important, and should be followed as described. This appendix gives a fictitious example which will help you when you are making the risk analysis for your own project. The steps to follow are:

a. draw up a list of the risks;
b. categorize the risks;
c. determine the global risk allocation and make a selection of the most important risks;
d. estimate the size, impact and probability of the risks;
e. assess the interrelationships (and correlation) of the risks you have defined;
f. draw up a risk matrix;
g. determine the probability distribution;
h. study any possible correlations;
i. calculate the value of the risks;
j. present the results.

a. Draw up a list of the risks

In previous parts of the project, overviews of risks have already been drawn up. You use these overviews in the first step where you identify all conceivable risks that might be relevant to your project. There are two important considerations when drawing up this risk overview. First of all, the list is never complete. This is a continuous process, where you keep coming back to reconsider whether you have forgotten any possible risks. Secondly, it's important to take all conceivable risks seriously.

Creating this risk overview can be a complex exercise, especially for larger projects. Techniques such as holding a brainstorming session can be an important means to identifying all conceivable risks. At this stage of the risk analysis it is important to actually identify all conceivable risks. Involve in your brainstorming session or risk analysis working group as many experts as possible from within and outside your own organisation.

Possible participants are financial, economic, legal and technical experts, and people who have been involved in similar projects. In short, involve all people who can assess the risks related to their own specialist area and who have some practical experience. If possible try to use checklists and experience from reference projects. As we mentioned earlier, the PPP Knowledge Centre can provide you with information and put you in contact with those people who were involved in the risk analysis for other projects. You may even be given access to existing risk analysis reports.

Appendix 3 contains a checklist of risks. You can use this list as a guideline when drawing up the risk overview for your own specific project. You can enlist the support of specialist consultants to help identify the risks or to lead your brainstorming session or risk analysis working group.

b. Categorize the risks

Once you have identified all the risks, they need to be categorized. You need to think systematically to categorize the risks probably. On the one hand, this categorization will help you to see whether you have forgotten any risks. On the other hand you will see which risks are related to each other and they will be easier to review.

There are many ways in which the risks can be categorized. For instance: in chronological order, based on who bears responsibility for the risk or the project phase. The checklist in appendix C categorizes the risks per project phase.

Example 10 contains an example of a list of risks for a fictitious project which have been categorized.

c. Determine the global risk allocation and make a selection of the most important risks

Once you have drawn up a complete list of all risks, and you have referred to previous risk analyses, you can determine the allocation of risks for the public procurement option. For each risk you can determine who is best positioned to manage the risk and thus who will be the most costeffective manager of this risk. Generally speaking there are three categories:

- risks which a public authority wishes to keep or which the private party will not accept;
- risks which a public authority is eager to pass on to private parties;
- risks which the public authority considers passing on, but which could also be shared with the private party.

It is essential that the allocation of risks is understood to be able to compare (in the PPC and the PSC) the public and PPP procurement options. Risks that remain with the public sector in both cases are not relevant in the comparison.

Example 11 shows an example of the risk allocation results.

d. Estimate the size, impact and probability of the risks

In order to draw up the risk matrix you need to have an idea of:

- the size and timing of the risks;
- the probability that the risk will occur.

If you have access to risk data from similar projects or if the risks can be insured on the open market, then it is relatively simple to value the risks. However, in most cases it is not that simple. One pitfall is that you identify a risk as being unquantifiable too early in the process. The advice and experience of experts is useful here.

Estimating the value and probability of risks is not an exact science. It is therefore advisable to document which assumptions you have made and which references you have used at each stage. This also applies to the degree in which the experts agree with each other about the estimates. Substantial differences between the estimates made by experts can lead to even more uncertainty.

A full analysis of the probability distribution for the occurrence of risks is expensive. You may decide to make a selection of the most important risks and to analyse these in more detail. For example, concentrate only on the risks with the greatest probability or those risks which will have the biggest impact. Alternatively you may decide to make a selection of the risks which have an impact of a certain percentage on the total cash flow of the project (for example 1% or more). In this way the project team can concentrate on the most relevant risks.

Example 12 shows a summary of the results where the size and probability of the risks have been estimated. It's important that there should always be an explanation to accompany such a spreadsheet.

e. Assess the interrelationships (and correlation) of the risks you have defined

Some risks are independent. But a risk can also be related to another risk. This means that the probability of the one risk occurring provides information about the probability of the related risk occurring.

A possible pitfall when drawing up the risk analysis is to ignore the existence of a relationship between risks. The possible relationship between risks can influence the final calculation of the risk value. Ignoring this relationship can lead to unrealistic scenarios. For example, the chance that there is a scarcity of suitable personnel is not unrelated to the chance of higher personnel costs.

Determining which risks are related is one of the most difficult parts of the risk analysis. To what degree are the risks identified related? To measure this, the term correlation is often used. A complication is that only a few risks:

- have perfect positive correlation (the risks always occur, or do not occur together; a one-to-one situation);
- have perfect negative correlation (the risks are exclusive, an either-or situation);
- are completely independent (the risks have absolutely no influence on each other).

The reality is that there is usually some degree of correlation between the risks, but that the degree to which the risks are related is difficult to determine.

Example 13 shows a general assessment of the correlation between risks; at this stage no consequences have been linked to the risks.

f. Draw up a risk matrix

You can summarize all the available information in a risk matrix. A risk matrix is in fact no more that a summary of the risks identified.

Example 14 shows an example of a risk matrix.

g. Determine the probability distribution

Depending on size of the project, the expertise available in the project team and in the risk analysis working group you can attempt to estimate the probability distribution for the most important risks. This improves and substantiates the assessment of the risks. You can get your experts to make an estimate of the maximum impact, the minimum impact as well as the most probable outcome. You can also ask your experts whether they consider each value between the minimum and the maximum to be equally probable (uniform distribution), or whether the value increases or decreases towards the maximum or minimum (a triangular distribution), or that the values can best be considered as separate scenarios, each with their own chance of occurring. This also helps you to understand the degree of risk distribution, also for the technical risk.

Estimating the risk value and distribution of probability for risks is not an exact science. The exercise explained here is therefore no more than a refinement of the assessment of the risks based on the current understanding. It is, and always will be, a forecast.

It may be that even the experts have quite different opinions about the valuation of the risks or the probability that a particular risk will occur. In such cases, the most pragmatic approach you can take is to calculate the average value and then clearly explain how the opinions of the experts differ. Where there are doubts about the valuation of risks which have a considerable impact or high degree of probability it can be advisable to research the risk further by consulting other experts.

In Example 15 the risk matrix has been supplemented with an assessment of the probability distribution.

h. Study any possible correlations

Now that you have identified the relationships between some risks (in Step 5) you will want to be certain of the correlation of the most important risks with other risks. You can do this using the risk matrix. By combining all identified risks per risk category and then, by dismissing all unrealistic combinations, you can make a global estimate of correlation. In this way you can incorporate the correlation between risks in the analysis.

Even more complicated is incorporating the degree of correlation. Using the opinions of your experts you can estimate the actual degree of correlation. These estimates can be subsequently quantified using specialized statistical techniques.

i. Calculate the value of the risks

There are several methods available to calculate the value of all risks. The two most important methods are:

- the deterministic method;
- the scenario analysis.

The deterministic method sums all the average values of the risks, and adds an uncertainty margin. This calculation can be carried out relatively quickly and gives you a rough estimate of the value of all the risks.

This scenario analysis concentrates on the total value of the most important risks and incorporates the underlying correlation. This calculation can also be carried out relatively quickly and in this case it gives you a general estimate of the value of the risks in several scenarios.

Example 16 and 17 show the risk valuation calculated using both methods.

j. Present the results

For the presentation of the results you can consider using graphics with a clear textual explanation. It is not sufficient to just state the mathematical or statistical formula and its results; you must explain this in "real language".

Example Risk analysis

The outcome of the risk analysis has resulted in a value of € 16.3 million with normal distribution, a certainty of 95%. The equivalent in "real language" is: the average value of the risks is € 16.3 million with a 95% probability that the actual value of the risk is between € 15.39 million and € 17.01 million.

5. The valuation of spread risks

As we mentioned earlier, this manual differentiates between technical spread risks and market-related spread risks.

5.1 Technical spread risks

You can determine and value the technical spread risks separately, using a risk matrix. However, since this manual first explains how pure risks are valued, we can refer to Paragraph 4 of this appendix where the use of the risk matrix is described.

To determine an individual technical risk you first calculate the expected size of the risk and the probability that it will occur for several scenarios. You can enlist help from experts and consult statistics and relevant research available.

Example Technical spread risks

Taske discusses two technical spread risks with the project team; the unpredictable weather and the fluctuations in the price of oil. The team values these risks by calculating the expected size of the risk and the probability that it will occur for several scenarios. They use statistics provided by the Central Statistics Office.

Estimates are made for various scenarios. The underlying assumptions are verified in two discussions with experts. The cost estimate in the rough PSC is based on an average of 10 days where temperature is below 0 °C per winter and the oil price is taken at $18 per barrel. In the analysis of the two technical spread risks below the value of the spread of these estimates is calculated.

meteorological circumstances	effect	probability	value
1. mild winter: 5 days below 0°C	-3,000,000	10%	-300,000
2. average winter: 5 days below 0°C	0	20%	0
3. winter period: 15 days below 0°C	3,000,000	45%	1,350,000
4. winter period: 20 days below 0°C	6,000,000	20%	1,500,000
5. maximum: 25 days below 0°C	9,000,000	5%	450,000
valuation of risk of disadvantageous weather:			3,000,000

price of oil	effect	probability	value
1. under average price $18	-3,000,000	20%	-600,000
2. average price $18	0	45%	0
3. slightly higher than average price	3,000,000	20%	600,000
4. considerably high price	6,000,000	10%	600,000
5. extremely high price	9,000,000	5%	450,000
valuation of risk of fluctuations in the price of oil:			1,050,000

Taske subsequently creates the cash flow chart including the valuation of these spread risks. A second method to determine the technical spread risks is to calculate the 84% value for all the risks. This means that a value is assigned to the probability that a budgeted amount turns out to be higher than expected (50% estimate).

Example 84% value

Together with her risk analysts Taske studies the risk concerning unfavourable ground and soil conditions. According to the risk matrix the experts have estimated that the damage is at least € 2.5 million and will be no more than € 7.5 million. The most probable value of the damage, according to the normal distribution, is € 5 million. This is the 50% value. Taske then mentions that, for the PSC, she would rather see that 84% of the risk valuations are not under estimated. The risk analysts perform a statistical analysis based on the standard normal distribution. They determine the standard deviation and calculate that the value of this risk is about € 1 million higher. The 84% value is thus € 6 million instead of € 5 million. The value of the spread is therefore € 1 million (€ 6 less € 5 million).

5.2 Market related spread risks

It is preferable to determine the market-related spread risks using a combination of the benchmark method and the cost of capital method. A partial overlap between the market related spread risks and the valuation of the technical spread and pure risks is unavoidable. You can keep the probability of overlap to a minimum by carefully choosing the correct assignment of risks.

5.3 Benchmark method

If good benchmark data is available then this is a good method to determine risk factors in the same way as the capital market would do for similar projects. Generally speaking this is an increase to cover all project risks which are not otherwise covered which the providers of funds more or less assume for themselves.

The benchmark method refers to similar projects and uses the results of the risk valuation from these projects as input for the risk analysis in the current project. The problem is that each project has its own unique characteristics and that generally speaking it is not easy to find a similar project. A disadvantage of this method can also be that too little attention is paid to the process of understanding and valuing the risks. Experience also shows that it has often been necessary to correct the risk factor for the project-specific allocation of risks within the benchmark.

Cost of Capital

The risk factor determined using the benchmark can be verified by calculating the costs and assets of an SPV by referring to the average required yield during the life cycle of the project. The Weighted Average Cost of Capital is usually used here. You can use this method to calculate the size of the risk factor which the capital market would charge and in this way the calculated value can be verified against the benchmark. The important factor here is the risk which the financiers bear and the percentage that they charge for this.

From experience in other countries we know that the risk surcharge demanded is mostly higher in the initial investment phase of the project than in the latter management and maintenance phase. Most projects are therefore refinanced after a few years with lower interest rates. Also the ratio of internal to external capital as well as the risk profile will change during the life cycle of the project. The required return on internal and external capital is therefore not constant but should be calculated as a weighted average over the complete life cycle of the project.

The required return on investment depends on the risk of the market in which the project is carried out. The remuneration required from the financiers reflects the level of risk which they see in the cash flow on which they depend for their repayment. The credit providers (bankers, bond holders, etc.) ask a higher rate than the inter-bank interest rate (the rate at which they can borrow money themselves). The shareholders want a return on the capital which they have invested. A standard method to calculate the level of this risk is to determine the Weighted Average Cost of Capital (WACC) for the organisation, less the risk-free interest rate (the interest on government bonds with the same period to maturity).

Example

The benchmark

In the example shown in the PSC manual, the assumption was made that a similar project in England (design, construction and exploitation of a road with a tunnel for 12 years) had a risk premium of 1.85% above the nominal risk-free interest rate. Taske's project team has subsequently made a careful study of the risk allocation for both projects and made comparisons. They have also taken into consideration the shorter development period for the A101/A18 project. This ultimately led to a correction of the risk premium by -0.35%, or in other words, a risk premium of 1.5% was calculated. Taske asked two specialized consultants, who were selected in consultation with the PPP Knowledge Centre to calculate the expected cost of capital for the private parties. This calculation resulted in an almost identical risk premium. Using this analysis Taske decides that the market related spread risk should be valued with a risk premium of 1.5%. This percentage does not influence the cash flow, but it does affect the interest rate applied to the project. This is increased to 7.5%

6. Conclusion

The description of risk analysis given in this appendix is intended to be a general explanation. If required, the PPP Knowledge Centre can help you to find expert support and examples of risk analyses which have already been carried out.

The table below shows the most commonly used methods for the valuation of risks:

Risk valuation

pure risks	valuation based on risk matrix	include in cash flows
+		
technical distributed risks	either: value using risk matrix	include in cash flows
	or: value by calculating the x% value	include in cash flows
market-related spread risks	either: benchmark method	incorporate in interest rates (risk factor)
	or: cost of capital method	incorporate in interest rates (risk factor)

Appendix

C

Appendix C: risk checklist

Project phase	Risk category	Risk description
Design	Design	- Unclear design specifications - Potential for design modifications - Integration problems between the design and the optimisation of the operating phase - Integration problems between the design and current legislation and time restrictions (for example regarding health and safety)
Construction	Construction/ Building	- Inexperienced firm of civil engineers / poor performance in the past - Exceeding construction costs - Consequences of design modifications for the construction costs - Unrealistic project planning and timing - Complications in the construction programme or construction plan - Unfavourable ground and soil conditions or unfavourable location - Accessibility of the location and security of the construction site - Liability to third parties - Actions taken by protest groups (physical or legal) which may result in delay of the construction - Default on the part of subcontractors - Changes in legislation which have consequences for the design or the construction - Project management including procedure for temporary housing - Testing the handover procedures - Risk of supplies from third parties - Force majeure and delays, temparary works, additional work and reparations

Project phase	Risk category	Risk description
	Sponsors	- General and specific experience of sponsors - Financial strength of sponsors - Willingness of sponsors and the strategic relevance of the project - Market position of the sponsors
	Technology	- Inability to meet the output specifications - No commercially proven success on a similar scale - Availability of alternative suppliers - Technological ageing
Completion	Purchaser	- Financial strenght of purchaser - Legal status of contract partners / change within the procuring authority - Change in statutory responsibilities of the public authority - Lack of experience on the part of the commissioning authority for this type of project
	Market risk or spread risk	- Market demand / volume - Fluctuations in market prices - Existence and nature of competition - Impact of regulation and legislation - Macro-economic influences
Management & maintenance	Operational risks	- Unrealistic performance criteria - Cost of operational contracts and contracts with service suppliers - Availability of alternative operators and suppliers of services - Specific changes to regulations and legislation - Expertise of the people carrying out operational services including planning budgeting and staffing - Poor operational procedures and performance monitoring
	Supply risk	- Risk of delay due to poor supply - Availability of alternative suppliers - Increase in purchasing costs
	Maintenance	- Importance of assets renewal during the exploitation risk or concession period - Adequacy of the repayment obligations in relation to of maintenance costs - Significant renovation costs - Fluctuations in the timing of the costs during the product life cycle - Conditions at hand over - Level of character of the life cycle costs (increasing or decreasing)
	Technology	- Technological obsolesence - Change of operators - Ability to meet changing requirements and conditions
Other risks or general risks	Rules and legislation	- Changes in taxation and fiscal conditions - Changes in legal requirements (discriminatory and non-discriminatory) - Changes in health and safety regulations - Changes in environmental law - Changes in employment law and regulations
	Political risks	- Political changes in policy affecting assumptions and conditions
	Territorial risks	- Transfer risks (across national borders) - Political stability
	Financial risks	- Residual value risk - Duration of the agreement / average life cycle - Required reserves - Inflation risks - Refinancing risks
	Financial structure	- Vulnerability to currency fluctuations - Capital structure - Control of project costs - Quality of collateral (including legal enforcement)
	Force majeure	- Force majeure - Disasters - Other unforeseen circumstances

Appendix

D

Appendix D: the change protocol

There is a possibility that the PSC, dated (...), will need to be changed. The changes are designed to improve:

- the benchmark;
- the comparison between the PSC benchmark and the private bid.

Adjustments to the PSC may be due to one of the following:

- changes in the time period covered by the PSC.
- changes in the discount rate used.
- changes in the taxable amounts.
- interim changes in assumptions, circumstances or interpretation.
- omissions or errors in the calculations in the PSC model.
- omissions or errors in the risk analysis.
- omissions or errors in the estimates.

[CUSTOMIZE THE ABOVE POINTS PER PROJECT]

The following change procedure will be followed

- the PSC team suggests the change (initiation).
- the Project Director agrees the change (authorisation).
- the PSC team apply the change in the calculations (implementation).

Appendix

E

Appendix E: differences between the old and the new PSC manuals

The most important changes to the Public Sector Comparator manual, dated October 1999 are:

- extra attention is paid to the preparation of the PSC with the addition of the Inception report.
- the PSC has been split into three parts, the crude PSC, risk analysis and supplementary financial considerations.
- the PSC is a financial benchmark. The economic PSC is not within the scope of this manual.
- This manual focuses on all costs, income and risks which are relevant for the reference model and the public procurement option.
- this manual guides potential users of the PSC step by step through the content and organisation of the PSC. The combination of both aspects is required to draw up an effective PSC.
- the case study and figures used in the examples provide the reader with a good understanding of the practical application of the manual.
- the manual describes the steps to be taken and provides a clear description of the output expected per module.

Appendix B gives an explanation of risk analysis techniques.

Appendix

F

Appendix F: worked examples

Example 1 Transaction costs

Transaction costs	total costs	2002	2003	2004	2005	2006	2007	2008
Legal costs	950,000	950,000						
% contract management	750,000	750,000						
Total	1,700,000	1,700,000						

Transaction costs	2009	2010	2011	2012	2013/2032	2033
Legal costs						
% contract management						
Total						

Example 2 Realisation costs

Realisation costs	total costs	2002	2003	2004	2005	2006	2007	2008
Acquisition of land	3,407,000	2,044,200	1,362,800					
Design	7,420,000	5,936,000	1,484,000					
Preparation of land	3,460,000		1,730,000	1,730,000				
Insurance costs	900,000			180,000	270,000	270,000	180,000	
Management costs	2,650,000	441,649	441,649	441,649	441,649	441,649	441,649	
Tunnel construction								
/ time & materials	113,975,000			22,795,000	34,192,500	34,192,500	22,795,000	
Road construction								
/ time & materials	86,649,000			34,659,600	34,659,600		17,329,800	
Total	218,461,000	8,421,849	5,018,449	59,806,249	69,563,749	34,904,149	40,746,449	

Realisation costs	2009	2010	2011	2012	2013/2032	2033
Acquisition of land						
Design						
Preparation of land						
Insurance costs						
Management costs						
Tunnel construction						
/ time & materials						
Road construction						
/ time & materials						
Total						

Example 3 Exploitation costs

Maintenance costs	total costs	2002	2003	2004	2005	2006	2007	2008
Replace road surface	25,000,000							
Periodic road maintenance	11,000,000							
Modernisation security systems	15,000,000							
Operational costs	**total costs**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Management & supervision	21,491,100	798,020	457,680	5,918,460	6,885,210	3,419,250	4,012,480	
Insurance costs	3,375,000						125,000	125,000
Security surveillance in tunnel	8,100,000						300,000	300,000
Management of road	58,025,970						2,149,110	2,149,110
Total	141,992,070	796,018	455,677	5,916,456	6,883,205	3,417,244	6,584,583	4,398,102

Maintenance costs	2009	2010	2011	2012	2013/2032	2033	
Replace road surface				12,500,000			
Periodic road maintenance					1,826,000		
Modernisation security systems							
Operational costs	**2009**	**2010**	**2011**	**2012**	**2013/2032**	**2033**	
Management & supervision							
Insurance costs	125,000	125,000	125,000	125,000	125,000	125,000	
Security surveillance in tunnel	300,000	300,000	300,000	300,000	300,000	300,000	
Management of road	2,149,110	2,149,110	2,149,110	2,149,110	2,149,110	2,149,110	
Total	2,572,101	2,572,100	2,572,099	15,072,098	2,574,110	4,398,077	

Example 4 Income

Income from sale / rental	total costs	2002	2003	2004	2005	2006	2007	2008
Land	1,200,000						1,200,000	
Buildings	6,750,000						250,000	250,000
Income based on residual value	**total costs**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
N/A								
Total	7,950,000						1,450,000	250,000

Income from sale / rental	2009	2010	2011	2012	2013/2032	2033	
Land	250,000	250,000	250,000	250,000	250,000	250,000	
Buildings							
Income based on residual value	**2009**	**2010**	**2011**	**2012**	**2013/2032**	**2033**	
N/A							
Total	250,000	250,000	250,000	250,000	250,000	250,000	

Example 5 Cash flow chart

Cash flow chart	total costs	2002	2003	2004	2005	2006	2007	2008
Transaction costs	1,700,000	1,700,000						
Realisation costs	218,461,000	8,421,849	5018,449	59,806,249	69,563,749	34,904,149	40,746,449	
Exploitation costs	141,992,070	796,018	455,677	5,916,456	6,883,205	3,417,244	6,584,583	4,398,102
Income (ultimo)	7,950,000						1,450,000	250,000
Cash flow	354,203,070	10,917,867	5,474,126	65,722,705	76,446,954	38,321,393	45,881,032	4,148,102

Cash flow chart	2009	2010	2011	2012	2013/2032	2033	
Transaction costs							
Realisation costs							
Exploitation costs	2,572,101	2,572,100	2,572,099	15,072,098	2,574,110	4,398,077	
Income (ultimo)	250,000	250,000	250,000	250,000	250,000	250,000	
Cash flow	2,322,101	2,322,100	2,322,099	14,822,098	2,324,110	4,148,077	

Example 6 List of pure risks

Risk category	Size	Probability	Effect	Correction on
1. Risk of unfavourable results bidding process	13,000,000	33.30%	4,329,000	transaction
2. Unfavourable ground and soil conditions	5,000,000	5.00%	250,000	realisation
3. Design risk	500,000	2.50%	12,500	realisation
4. Risk of extra costs during realisation phase	55,500,000	15.00%	8,325,000	realisation
5. Technical risk tunnel piling techniques	5,120,000	25.00%	1,280,000	realisation
6. Risk of extra costs during exploitation phase	8,300,000	25.00%	2,075,000	exploitation
Total valuation of the risks			16,271,500	

Example 7 Cash Flow chart including pure risks

Cash flow chart	total costs	2002	2003	2004	2005	2006	2007	2008
Transaction costs	1,700,000	1,700,000						
Realisation costs	218,461,000	8,421,849	5,018,499	59,806,249	69,563,749	34,904,149	40,746,449	
Pure risks transaction & realisation	14,196,500	547,287	326,120	3,886,458	4,520,540	2,268,216	2,647,873	
Exploitation costs	141,992,070	796,018	455,677	5,916,456	6,883,205	3,417,244	6,584,583	4,398,102
Pure risks exploitation	2,075,000	11,633	6,659	86,460	100,588	49,938	96,224	64,272
Income (ultimo)	7,950,000						1,450,000	250,000
Cash flow including pure risks	370,474,570	11,476,786	5,806,905	69,695,623	81,068,082	40,639,547	48,625,129	4,212,374
Nominal discount rate (6%)	1.06	1.06	1.12	1.19	1.26	1.34	1.42	1.50
Present value cash flow	6%	10,827,157	5,168,124	58,517,789	64,213,514	30,368,234	34,278,797	2,801,469
Net Present Value (per 31-12-2002)	244,212,653	244,212,653						

Cash flow chart	2009	2010	2011	2012	2013/2032	2033	
Transaction costs							
Realisation costs							
Pure risks transaction & realisation							
Exploitation costs	2,572,101	2,572,100	2,572,099	15,072,098	2,574,110	4,398,077	
Pure risks exploitation	37,587	37,587	37,587	220,256	37,617	64,271	
Income (ultimo)	250,000	250,000	250,000	250,000	250,000	250,000	
Cash flow including pure risks	2,359,688	2,359,687	2,359,686	15,042,354	2,361,727	4,212,348	
Nominal discount rate (6%)	1.59	1.69	1.79	1.90	6.09	6.45	
Present value cash flow	1,480,498	1,396,695	1,317,637	7,924,124	387,925	652,735	
Net Present Value (per 31-12-2002)							

Example 8 Cash flow chart with higher discount rate / calculation risk distribution

Cash flow chart	total costs	2002	2003	2004	2005	2006	2007	2008
Cash flow including pure risks	370,474,570	11,476,786	5,806,905	69,695,623	81,068,082	40,639,547	48,625,129	4,212,374
Discount rate (7.5%)	1.075	1.08	1.16	1.24	1.34	1.44	1.54	1.66
Present value cash flow	7.50%	10,676,080	5,024,904	56,102,228	60,703,823	28,307,827	31,507,212	2,539,029
Net Present Value								
(per 31-12-2002)	225,059,454	225,059,454						
Present value cash flow								
/ discount rate = 6%	6.00%	10,827,157	5,168,124	58,517,789	64,213,514	30,368,234	34,278,797	2,801,469
Present value cash flow								
/ discount rate = 7.5%	7.50%	10,676,080	5,024,904	56,102,228	60,703,823	28,307,827	31,507,212	2,539,029
Max. valuation								
risk distribution	19,153,199	151,077	143,220	2,415,561	3,509,691	2,060,406	2,771,585	262,440

Cash flow chart	2009	2010	2011	2012	2013/2032	2033
Cash flow including pure risks	2,359,688	2,359,687	2,359,686	15,042,354	2,361,727	4,212,348
Discount rate (7.5%)	1.78	1.92	2.06	2.22	9.41	10.12
Present value cash flow	1,323,083	1,230,774	1,144,905	6,789,264	250,938	416,345
Net Present Value						
(per 31-12-2002)						
Present value cash flow						
/ discount rate = 6%	1,480,498	1,396,695	1,317,637	7,924,124	387,925	652,735
Present value cash flow						
/ discount rate = 7.5%	1,323,083	1,230,774	1,144,905	6,789,264	250,938	416,345
Max. valuation						
risk distribution	157,415	165,921	172,731	1,134,860	136,987	236,389

Example 9 Cash flow chart including all risks and inflation

Cash flow chart	total costs	2002	2003	2004	2005	2006	2007	2008
Transaction costs	1,700,000	1,700,000						
Realisation costs	218,461,000	8,421,849	5,018,449	59,806,249	69,563,749	34,904,149	40,746,449	
Pure risks	14,196,500	547,287	326,120	3,886,458	4,520,540	2,268,216	2,647,873	
preparation and realisation								
Exploitation costs	141,992,070	796,018	455,677	5,916,456	6,883,205	3,417,244	6,584,583	4,398,102
pure risks exploitation	2,075,000	11,633	6,659	86,460	100,588	49,938	96,244	64,272
Income (ultimo)	7,950,000					1,450,000		250,000
Cash flow excluding								
distribution	370,474,570	11,476,786	5,806,905	69,695,623	81,068,082	40,639,547	48,625,129	4,212,374
Risk spread	19,153,199	151,077	143,220	2,415,561	3,509,691	2,060,406	2,771,585	262,440
Cash flow incl. risk spread	389,627,769	11,627,863	5,950,125	72,111,183	84,577,773	42,699,953	51,396,713	4,474,814
Inflation (2%)	1.02	1.00	1.02	1.04	1.06	1.08	1.10	1.13
Nominal cash flow		11,627,863	6,069,128	75,024,475	89,754,610	46,219,803	56,746,125	5,039,367
Nominal discount rate (6%)	1.06	1.06	1.12	1.19	1.26	1.34	1.42	1.50
Present value cash flow	6%	10,969,682	5,401,502	62,991,996	71,094,058	34,538,125	40,003,779	3,351,467
NPV (per 31-12-2002)	284,566,379	284,566,379						

Cash flow chart	2009	2010	2011	2012	2013/2032	2033
Transaction costs						
Realisation costs						
Pure risks						
preparation and realisation						
Exploitation costs	2,572,101	2,572,100	2,572,099	15,072,098	2,574,110	4,398,077
pure risks exploitation	37,587	37,587	37,587	220,256	37,617	64,271
Income (ultimo)	250,000	250,000	250,000	250,000	250,000	250,000
Cash flow excluding						
distribution	2,359,688	2,359,687	2,359,686	15,042,354	2,361,727	4,212,348
Risk spread	157,415	165,921	172,731	1,134,860	136,987	236,389
Cash flow incl. risk spread	2,517,104	2,525,609	2,532,417	16,177,214	2,498,713	4,448,738
Inflation (2%)	1.15	1.17	1.20	1.22	1.81	1.85
Nominal cash flow	2,891,361	2,959,153	3,026,473	19,719,934	4,526,073	8,219,438
Nominal discount rate (6%)	1.59	1.69	1.79	1.90	6.09	6.45
Present value cash flow						
NPV (per 31-12-2002)	1,814,075	1,751,518	1,689,967	10,388,215	743,429	1,273,663

Example 10 List of risks (pure risks) & categorization)

Risk	Risk Description	Example	Risk category
- Risk of unfavourable results of bidding process	- Risk of unfavourable results bidding process	- Few bidders therefore high prices	- Transaction risk
- Design risk	- Probability of gaps in the design	- Inadequate lighting	- Realisation risk
- Risk of unfavourable ground and soil conditions	- Probability of unfavourable ground and soil conditions	- Archaeological finding	
- Risk of extra costs during realisation phase	- Probability of large accident	- Damage to works	
- Risk of extra costs during realisation phase	- Probability of flooding	- Inundations of works	
- Risk of extra costs during realisation phase	- Probability of protest demonstrations	- Environmental protests that interrupt the works	
- Technical risk	- Probability of problems with piling	- Ground conditions differ from trial results	
- Risk of extra costs during exploitation phase	- Probability of supplementary security requirements	- Law requiring additional safety measures.	- Exploitation risk
- Risk of extra costs during exploitation phase	- Replacement investment sooner than planned	- Faster deterioration of asphalt road surface	

Example 11 Allocation of risks

Risk and number	Allocation of risk
1. Risk of unfavourable results bidding process	Keep
2. Unfavourable ground and soil conditions	Transfer or share
3. Design risk	Transfer
4. Risk of extra costs during realisation phase	Transfer
5. Technical risk tunnel piling techniques	Transfer
6. Risk of extra costs during exploitation phase	Transfer

Example 12 Estimate of size and probability

Risk and number	Size	Probability	Effect	Risk category
1. Risk of unfavourable results bidding process	13,000,000	33.00%	4,329,000	transaction
2. Unfavourable ground and soil conditions	5,000,000	5.00%	250,000	realisation
3. Design risk	500,000	2.50%	12,500	realisation
4. Risk of extra costs during realisation phase	55,500,000	15.00%	8,325,000	realisation
5. Technical risk tunnel piling techniques	2,500,000	25.00%	625,000	realisation
6. Risk of extra costs during exploitation phase	8,300,000	25.00%	1,980,000	exploitation
Total valuation of the risks			16,271,500	

Example 13 Determine relationship between risks

Risk and number	Relationship to other risks
1. Risk of unfavourable results bidding process	None
2. Unfavourable ground and soil conditions	None
3. Design risk	None
4. Risk of extra costs during realisation phase	With R5
5. Technical risk tunnel piling techniques	With R4
6. Risk of extra costs during exploitation phase	None

Example 14 Risk matrix (pure risks)

Risk and number	Size	Probability	Effect	Risk category	Allocation	Relationship
1. Risk of unfavourable results bidding process	13,000,000	33.00%	4,329,000	Transaction	Keep	None
2. Unfavourable ground and soil conditions	5,000,000	5.00%	250,000	Realisation	Share	None
3. Design risk	500,000	2.50%	12,500	Realisation	Transfer	None
4. Risk of extra costs during realisation phase	55,500,000	15.00%	8,325,000	Realisation	Transfer	With R5
5. Technical risk tunnel piling techniques	2,500,000	25.00%	625,000	Realisation	Transfer	With R4
6. Risk of extra costs during exploitation phase	8,300,000	25.00%	1,980,000	Exploitation	Transfer	None
Total valuation of the risks			**16,271,500**			

Example 15 Extended risk matrix

Risk and number	Probable Size	Highest Probability	Lowest Effect	Type of Risk category	Allocation	Relationship
1. Risk of unfavourable results bidding process	13,000,000	33.00%	4,329,000	Transaction	Keep	None
2. Unfavourable ground and soil conditions	5,000,000	5.00%	250,000	Realisation	Share	None
3. Design risk	500,000	2.50%	12,500	Realisation	Transfer	None
4. Risk of extra costs during realisation phase	55,500,000	15.00%	8,325,000	Realisation	Transfer	With R5
5. Technical risk tunnel piling techniques	2,500,000	25.00%	625,000	Realisation	Transfer	With R4
6. Risk of extra costs during exploitation phase	8,300,000	25.00%	1,980,000	Exploitation	Transfer	None
Total valuation of the risks			**16,271,500**			

Risk and number	Probable Impact	Highest impact	lowest impact	Type of distribution
1. Risk of unfavourable results bidding process	13,000,000	19,000,000	9,000,000	Distorted
2. Unfavourable ground and soil conditions	5,000,000	20,000,000	2,000,000	Distorted
3. Design risk	500,000	750,000	250,000	Uniform
4. Risk of extra costs during realisation phase	55,500,000	80,000,000	37,500,000	Distorted
5. Technical risk tunnel piling techniques	2,500,000	4,500,000	500,000	Uniform
6. Risk of extra costs during exploitation phase	8,300,000	15,000,000	5,000,000	Distorted
Total valuation of the risks				

Example 16 Deterministic valuation of risks

Risk and number	Size	Probability	Effect
1. Risk of unfavourable results bidding process	13,000,000	33.00%	4,329,000
2. Unfavourable ground and soil conditions	5,000,000	5.00%	250,000
3. Design risk	500,000	2.50%	12,500
4. Risk of extra costs during realisation phase	55,500,000	15.00%	8,325,000
5. Technical risk tunnel piling techniques	2,500,000	25.00%	625,000
6. Risk of extra costs during exploitation phase	8,300,000	25.00%	1,980,000
Total valuation of the risks			**16,271,500**

The value of the risks is estimated at € 16,3 million. An uncertainty percentage of x% will be applied throughout.

Example 17 Risk valuation based on scenario analysis

Risk and number	Size	Probability	Optimistic estimate Probability	Effect	Pessimistic Estimate Probability	Effect
1. Risk of unfavourable results bidding process	13,000,000	33.00%	16,65%	6,500,000	67.00%	26,000,000
2. Unfavourable ground and soil conditions	5,000,000	5.00%	2,50%	2,500,000	10.00%	10,000,000
3. Design risk	500,000	2.50%	1,25%	250,000	5.00%	1,000,000
4. Risk of extra costs during realisation phase	55,500,000	15.00%	7,50%	27,750,000	30.00%	111,000,000
5. Technical risk tunnel piling techniques	2,500,000	25.00%	12,50%	1,250,000	50.00%	5,000,000
6. Risk of extra costs during exploitation phase	8,300,000	25.00%	12,50%	4,150,000	50.00%	16,600,000
Total valuation of the risks						

The value of the risks varies between € 8.1 million and € 32.5 million, with the most probable value being € 16.3 million.

Further information

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