



Workshop on Risks and Opportunities of Road Maintenance Procurement for Knowledge and Competences of Road Agencies

16 September 2016
Delft, The Netherlands

Workshop Report



Table of content

1	Introduction	3
1.1	The BEST4ROAD Project	3
1.2	Workshop Objectives	4
1.3	Workshop Participants and Programme	4
2	Session 1: Road Maintenance Procurement Strategies.....	5
2.1	Objectives and Presentation.....	5
2.2	Results.....	6
3	Session 2: Quick Scan Method.....	8
3.1	Objective and Presentation	8
3.2	Results.....	8
4	Session 3: Procurement Risks and Opportunities.....	9
4.1	Objectives	9
4.2	Results.....	9
5	Session 4: Procurement Knowledge and Competences	10
5.1	Objective and Presentation	10
5.2	Results.....	11
	Annex I – Workshop Programme and Participants	13
	Annex II – Risks per category.....	14
	Annex III – Ranking risks.....	19

1 Introduction

1.1 The BEST4ROAD Project

The trans-national research programme “**Call 2014: Asset Management and Maintenance**” was launched by the Conference of European Directors of Roads (CEDR). CEDR is an organisation which brings together the road directors of 25 European countries. The aim of CEDR is to contribute to the development of road engineering as part of an integrated transport system under the social, economic and environmental aspects of sustainability and to promote co-operation between the National Road Administrations (NRA).

The participating NRAs in this Call are Belgium-Flanders, Finland, Germany, Ireland, Norway, the Netherlands, Sweden, United Kingdom and Austria. As in previous collaborative research programmes, the participating members have established a Programme Executive Board (PEB) made up of experts in the topics to be covered. The research budget is jointly provided by the NRAs who provide participants to the PEB as listed above.

BEST4ROAD is a two years project aiming at the development of best practice guidelines and tools for the efficient procurement of road maintenance in a changing world. Based on a comprehensive and integrative framework for maintenance procurement, the project will bring together the extensive, but yet scattered procurement knowledge and experiences at National Road Agencies (NRA’s) in 11 countries including the US and Australia. It will determine the lessons learnt at the NRA’s and based on that will develop a number of hands-on tools and step-by-step guidance for procuring road maintenance taking current and future challenges of NRA’s into account.

The benefit of the BEST4ROAD project for NRA’s lies in the integration of an in-depth study and comparison of maintenance procurement practices in different countries with the development of tools and guidelines that can be easily implemented and used at NRA’s. This will allow NRA’s to learn from their peers and at the same time improve their maintenance procurement practices to get prepared for future challenges such as staff turnover and shrinking budgets.

The BEST4ROAD project consists of seven work packages (WP):

- WP1 – Comparison of maintenance procurement practices
- WP2 – Maintenance procurement strategies and maintenance efficiency
- WP3 – Quick scan method for risk in maintenance procurement
- WP4 – Competence profiles and transition processes
- WP5 – Best practice guidelines
- WP6 – Dissemination and demonstration
- WP7 – Project management

As part of the BEST4ROAD project a workshop was conducted on 16 September 2016 in Delft, The Netherlands. The workshop was hosted by Deltaires, one of the Best4Road partners.

1.2 Workshop Objectives

The focus of the workshop was on the risks and opportunities of road maintenance procurement for knowledge and competences of NRAs. The workshop aimed at the discussion of benefits and limitations of existing procurement strategies at NRAs, the assessment of the risks and opportunities related to these strategies, and the determination of the competences and capabilities needed to follow certain strategies. Another objective was the identification of user and information needs for the development of the quick scan method for WP3 of the BEST4ROAD project.

1.3 Workshop Participants and Programme

The workshop attracted 14 participants from 6 countries including the Netherlands, Estonia, Norway, Sweden, UK and Italy. The participants are affiliated to NRAs, contractors, consultants, and research organizations.

The programme (see Annex I) consisted of four main sessions:

- Session 1: Road Maintenance Procurement Strategies
- Session 2: Quick Scan Method
- Session 3: Procurement Risks and Opportunities
- Session 4: Procurement Knowledge and Competences

The results of these session can be found in the following sections.

2 Session 1: Road Maintenance Procurement Strategies

2.1 Objectives and Presentation

The objective of the first session was to introduce different terms important for the project to provide a common understanding among the workshop participants. Furthermore, this session outlined the maintenance procurement strategies that form the basis for subsequent workshop sessions. Terms and strategies were presented by Juha Aijo (Ramboll/BEST4ROAD). The following terms were defined:

- Assets:

Assets are all physical objects that constitute the road system and are divided into structures and installed assets. Structures are constructed assets like bridges, tunnels, drainage and geotechnical structures. Installed assets are erected on and around the road like traffic signals, guardrails and bus stops.

- Maintenance tasks:

This term is defined according to two different types of maintenance: rehabilitation and regular/routine/periodic maintenance.

- Activities:

Maintenance activities are divided into operational and management activities. Through operational activities the actual physical maintenance work is carried out. Management activities are related to the broader asset management system and include the monitoring of asset performance, the planning and programming of operational activities.

- Contract types:

Three generic contract types can be distinguished: discrete, integrated and framework contracts. Discrete contracts are typically used for planned maintenance activities with project character. Framework contracts are typically used for planned and unplanned maintenance activities that are carried out within a specified time period on a call-off basis. Integrated contracts are typically used for planned maintenance activities that reoccur within a certain time period.

Based on the extent of outsourcing five procurement strategies are introduced:

Strategy A: Buy nothing

The road agency is doing all asset management tasks (e.g. performance monitoring, performance prediction, maintenance planning) and all maintenance tasks (e.g. road patching, grass mowing, winter maintenance) using in-house capacities.

Strategy B: Buy single maintenance tasks

The road agency is doing all asset management tasks (e.g. performance monitoring, performance prediction, maintenance planning) and single maintenance tasks (e.g. road patching) using in-house capacities and is buying single maintenance tasks (e.g. winter maintenance) from separate contractors.

Strategy C: Buy integrated maintenance tasks

The road agency is doing all asset management tasks (e.g. performance monitoring, performance prediction, maintenance planning) using in-house capacities and is buying integrated maintenance tasks (e.g. road patching, grass mowing, winter maintenance) from a single contractor.

Strategy D: Buy single asset management tasks

The road agency is doing single asset management tasks (e.g. maintenance planning) deploying in-house capacities and is buying other asset management tasks (e.g. performance monitoring) and all maintenance tasks (single or integrated) from separate contractors.

Strategy E: Buy all

The road agency is buying all asset management tasks (e.g. performance monitoring, performance prediction, maintenance planning) and all maintenance tasks (e.g. road patching, grass mowing, winter maintenance) from a single contractor.

Strategies A and E are extremes and can be hardly found in practice and thus were left out for the remaining sessions of the workshop. Strategies B, C and D are further elaborated and specified by adding additional aspects. Table 1 provides an overview of the three strategies.

2.2 Results

The plenary discussion revealed that some participant had a different understanding of some of the main terms. For example, one participant proposed to define regular/routine/periodic maintenance as operational maintenance which he thinks is a better description for the type of work that is done. Questions also arose in relation with the procurement strategies, particularly whether these strategies can be found in practices as described and whether agency should follow them. It has been stressed that the strategies are generic types and that in practice often a mix of different strategy aspects are used. The more generalized approach is required for the research project to analyze the risks related to different strategies and their aspects and to ensure comparability across NRA's. Here the point was made that certain strategies can reduce risks but at the same time introduce new ones.

It was also clarified that private ownership of the roads is not included in the research. The research is conducted from the perspective of the NRA's that are or represent the owners.

A general discussion emerged around the objectives of the BEST4ROAD project that is the relationship between procurement strategies and knowledge and competences of the NRAs. It was emphasized that one of the goals of CEDR with this project is to create an overview of how different countries procure road maintenance and what the consequences are for their knowledge and competences as a professional agency. For example, Rijkswaterstaat experiences a loss of knowledge and related to this a loss of control. It was mentioned that the amount of knowledge needed depends on the desired level of control.

From the perspectives of the contractor it was stated that at least Rijkswaterstaat is not setting the "playing field"- which is all about knowledge. What is missing is an agency being in charge of setting the playing field. The agency should be clear about what is outsourced, and should keep control of what is outsourced. There needs to be a defined level of knowledge that should remain in-house. The knowledge problem is also shared by NRA representatives from other countries. For example, in Norway the agency had development projects in house in the past whereas now that knowledge development is privatized. It was expected that there was going to be knowledge development at the private side; but that did not happen. In addition, criteria of minimum competences needed to be developed to be sure that people are able to do the required work. In Italy the agency does not have chosen for outsourcing but needs private firms, because the knowledge is no longer internally available.

Table 1: Procurement strategies

	Strategy B	Strategy C	Strategy D
Outsourced activities	<i>Single maintenance tasks</i> (e.g. winter maintenance, pavement renewal) are bought from <i>separate contractors</i>	<i>Integrated maintenance tasks</i> (e.g. road patching, grass mowing, winter maintenance) are bought from a <i>single contractor</i>	<i>Single asset management tasks</i> (e.g. performance monitoring) and <i>all maintenance tasks</i> (single or integrated) are bought from <i>separate contractors</i>
In-house activities	<i>All asset management tasks</i> (e.g. performance monitoring, performance prediction, maintenance planning) and <i>single maintenance tasks</i> (e.g. road patching)	<i>All asset management tasks</i> (e.g. performance monitoring, performance prediction, maintenance planning)	<i>Single asset management tasks</i> (e.g. maintenance planning)
Performance specification	<i>Task-related</i> : resources and activities that a contractor needs to allocate and carry out are specified	<i>Asset-related</i> : infrastructure asset conditions (e.g. roughness index) the contractor needs to achieve are specified	<i>Service-related</i> : value creation impacts of road assets for users and other stakeholders (e.g. availability) are specified
Payment mechanism	<i>Unit price</i> : unit items of maintenance activities are priced at rate per unit and the actual quantities of maintenance units carried out	<i>Lump-sum</i> : fixed price irrespective of the actual cost	<i>Cost plus fee</i> : reimbursement for the costs incurred plus a fee for overhead and profit
Contract duration	<i>Short-term</i> : 1-3 years without extension	<i>Medium-term</i> : 4-6 years with possible extension	<i>Long-term</i> : 7-10 years with possible extension
Tender evaluation	<i>Price-only</i> : the tender with the lowest price gets the contract awarded	<i>Price and quality</i> : the tender with a minimum quality score and the lowest price gets the contract awarded	<i>Quality and costs</i> : the tender with the highest combined non-cost and cost score gets the contract awarded
Performance monitoring	<i>Direct and frequent</i> : site inspections on a daily/weekly basis	<i>Direct but infrequent</i> : asset inspections on a yearly basis	<i>Indirect but frequent</i> : reporting of the contractor on a weekly/monthly basis

3 Session 2: Quick Scan Method

3.1 Objective and Presentation

The aim of the second workshop session was the identification of the functional requirements for the Quick Scan Method to be developed in the project. The main idea of the Quick Scan Method is to provide NRA's with a tool that allows them to identify risks related to certain procurement strategies. Based on this insight NRA's should be able to determine the procurement strategy to be adopted and utilized.

Thomas Bles and Monica Altamirano (both Deltares and BEST4ROAD) provided some background information about the reasons and possibilities for a risk scan. They showed existing examples for risk scans from other infrastructure risk areas such as climate change to illustrate the working of a risk scan. It appeared that the development of a risk is coming with a couple of challenges:

- The developed tool needs to be applicable in all Europe countries;
- Using of the scan needs to produce proper results with little effort;
- The scan could be applied on strategic level (which strategy for the organization) or operational level (which strategy for a certain road network).

3.2 Results

First a general discussion emerged with general comments on using a risk scan. It was stressed that procurement strategies are framed different per country, because of the national procurement rules and the path dependency. Another attendee mentioned that making choices introduces new risks, although they intend to mitigate stated risks. It was also emphasized that risks are often related with expected benefits particularly when implementing innovations. Benefits of strategies should be therefore included as well.

The discussion that followed addressed the question at which level the risk scan should be applied. Here, opinions differed. It was argued that because CEDR is a transnational agency it probably should be at a strategic level. Another opinion was that the quick scan probably would be most useful on project/network level to adapt to specific risks. Here, the scan could be used more often whereas at a strategic level it will not so often be applied. Another suggestion was to use the quick scan on both levels so that the biggest risks can always be treated appropriately. It was stated that the choice depends on whether or not the NRAs accept the fact that they lack knowledge and that they will need private companies for providing this knowledge.

The discussion moved then to the question how risk identification should be used in the quick scan. Should the risks be identified first and then a procurement strategy be chosen, or based on the choice of a procurement strategy the risks be identified? Here, it was said that both should be done and the best way will be possible to go back and forth between both options until all risks are acceptable. It was also stated that because of the lack of knowledge about procurement strategies within NRA's the first option will probably be the most suitable. At the same it was mentioned that procurement strategies should not be treated as 'one size fits all' but be created through the experience of experts within the organization(s). Although risks will define scope for possible strategies, it was questioned whether there is enough freedom to choose a procurement strategy. In this regard a Europe wide tool should be more general, because impacts are different around Europe.

This part of the workshop finished with an exercise asking all participants to give their preference to a list of pre-formulated functionalities and requirements for the risk scan.

4 Session 3: Procurement Risks and Opportunities

4.1 Objectives

The next workshop aimed at the identification of risks and opportunities related to the generic strategies presented in the first part of the workshop and ranking them. In a brainstorm session supported by a computer tool the participants described from their perspective the risks they see with the three procurement strategies B, C and D (Table 1) and with all strategies in general.

4.2 Results

The brainstorming exercise delivered 80 risks which subsequently needed to be ranked. Since ranking all these risks would have taken too much time, participants were divide into three groups ranking different risks. The highest ranked risks are listed below.

- Contract duration may not align to the duration on which proper maintenance strategies can be employed. Contractor decisions are based on maximizing benefits (profit?) within the contract scope while asset performance may benefit from other durations.
- No common or generally accepted systems, tools or guidelines for objective appreciation of the performance of the contractor.
- By outsourcing single maintenance tasks separately increased effort is required to align and coordinate maintenance activities. This may lead to problems if capabilities are not present at the contracting agency.
- The contractor loses interest in carrying out maintenance tasks when the costs he has made starts to reach the agreed fixed price.
- Level of technical expertise required to realize activities of strategy D may be even higher than for strategy B and should be based on long hands-on experience.

The other risks and their ranking can be found in Annex II.

5 Session 4: Procurement Knowledge and Competences

5.1 Objective and Presentation

The last part of this workshop was concerned with procurement knowledge and competences. The aim of this session was to answer the question: *How do we learn from projects/maintenance to develop competences and achieve knowledge retention? (at a team and organizational level)*

The knowledge and competences that are regarded to be present at NRAs are:

- Technical (e.g. asset design/build/maintain, traffic management, life-cycle management);
- Contractual (e.g. contract design, tendering process, contract monitoring);
- Relational (e.g. inter-personal and inter-organizational relationships; trust, information exchange).

Next, projects an organization is involved in may be usefully divided into two categories:

- Mainstream projects (routine, short-term gains, stable environment);
- New/Breakthrough projects (innovative and risky, experimenting, long-term rewards, uncertain environment).

Based on experiences from other industries Jens Roehrich (University of Bath/BEST4ROAD) further elaborated on these two categories and presented three development phases in which knowledge and competences are developed and honed:

- I. Breakthrough project learning
 - Established at the front of the organization to explore new competencies, technology etc.;
 - Often separate from mainstream business;
 - Phase of 'within project/activity' learning – exploration and experimentation.
- II. Project-to-project learning and competence development
 - Capture and transfer the experience and insights from breakthrough project/activity to subsequent projects;
 - 'Project-to-project' learning (e.g. through project accounts/guides, intranet, podcasts, war stories, project champions).
- III. Project-to-organizational level learning
 - Consolidate initial learning and systematically spread accumulated knowledge across the organization;
 - Institutionalize new project/activity routines and processes and new standardized and repeatable processes.

This session was concluded by dividing the participants into three groups in which the following two questions (along with sub-questions) were discussed:

1. Based on the procurement strategies discussed previously, what are the relevant technical, contractual and relational competencies needed (for yourself/team/organization/network)?
 - i. How do you develop these competencies (e.g. with your partnering organizations)?
 - ii. Which competencies are bought in from the outside?

2. Drawing upon your own experience, how does your team /organization foster and/or hinder learning?
 - i. What is working well? Are you aware of any good/best practices from your sector/other sectors?
 - ii. How could your team/organization overcome potential problems?

5.2 Results

The group discussions revealed that legal and contractor management skills are needed. For example, in Sweden and Norway there is a division between individuals who support the contract team to develop the tendering and the contract and individuals that do contract management. The people that are tendering contracts remain until the project is finished. This is a positive aspect, problem with contracts emerge when people do not know the spirit of the contract, but rather just look at contract clauses.

Another point made was that project managers and contract managers should be people from NRAs, individuals who can do monitoring and testing based on very clear (specified) procedures. The complexity and likelihood of conflicts sharply increases when they are dealt with by a third party who does not know the spirit of the contract.

It was also stated that NRAs need the technical/juridical knowledge to analyze and estimate risks to determine what to do in-house and what to outsource. They also need to be able to manage information and knowledge. Areal information and data management needs to be more profound and reliable.

NRAs also need some level of knowledge of Systems Engineering to control on what level of abstraction they operate (material or functional). In addition, NRAs and private organizations alike need to know where to find/get knowledge/competences that they do not have but may be need.

NRAs may benefit from some kind of pilot programs for uniform working across the NRA. Working uniformly will enable NRAs to share and develop knowledge in a better and easier way. This might be achieved by setting up a common register/intranet platform to share best/good practice. It is vital to learn from mistakes and avoid ‘blaming/shaming culture’ if projects are not successful. In an ideal world, best/good practice should be shared across NRAs to learn with and from each other.

In terms of team learning, some examples were given how NRAs facilitate knowledge exchange and development. In Norway, for example, the 5 regions meet every three months to exchange and capture lessons learnt. Besides that, each month there is a meeting with all the project leaders, going through questions and issues. A central maintenance and operations team goes to meetings to uncover issues, provide feedback, and to set up relevant courses, e.g. project management course.

In the Netherlands, best value procurement is used, allowing agencies and contractors to align their understanding. When a previous contractor hands over a project to a new one, this includes a team coach/expert that can relate to both parties from an external perspective.

Participants agreed that it is vital to acknowledge that there will be conflicts and that it is important to train staff in how to best deal efficiently and effectively with emerging conflicts.

Legal and relational skills are often available at NRAs, but, for instance, in the Netherlands there is a need for NRA staff to further gain a better understanding with regards to technical skills.

Organizations and teams need sufficient ‘mass’ to be able to pass on knowledge and competences to other employees or teams. One way of providing learning and a critical mass is for NRAs to cooperate with universities.

6 Concluding remarks

With the risks of maintenance procurement strategies and procurement knowledge and competences the workshop addressed a very current issue that revealed the lively discussion among the participants. Procurement of road maintenance is a challenging task that requires a certain set of technical, contractual and relational competences, in order to design and implement a procurement strategy. NRA's should carefully evaluate their existing knowledge base before embarking on new procurement strategies and assess the risks of strategies for maintenance outcomes and knowledge. The risks identified in the workshop can support in this regard.

Within the BEST4ROAD project the results of the workshop will be further analysed and used to develop a Quick Scan Method for procurement risks and knowledge and competence profiles needed for certain procurement strategies. The results of the project will be published on the project website: <http://best4road.weebly.com/>.

The discussions during the workshop were quite intense and there was not always enough time to deeply elaborate on particular issues. In order to allow a further exchange of ideas, opinions and arguments, we set up a forum and invite everybody to continue the discussions: <http://roadmaintenance.freeforums.net/>.

Finally, the BEST4ROAD consortium thanks all participants for their valuable contribution to the workshop, DELTARES for hosting the workshop, and CEDR for attracting attention to the workshop.

Annex I – Workshop Programme and Participants

Time	Title	Who
9.30	Arrival Participants and coffee	
10.00	Welcome	Thomas Bles
10.05	Introducing the BEST4ROAD project	Andreas Hartmann
10.15	Presentation of five procurement strategies with examples from different countries	Juha Äijö
10.35	Plenary discussion of strategies	All
11.00	Presentations of state of the art and ideas for a risk quick scan	Thomas Bles, Mónica A. Altamirano
11.30	Workshop 1 – Useful output of a quickscan, using a simple value engineering exercise (annex 1 for more detail of this workshop)	All
12.45	Lunch	
13.30	Workshop 2 – Identification of risks for different procurement strategies	All
14.45	Coffee break	
15.00	Presentation of competency development and knowledge retentions	Jens Roehrich
15.20	Workshop 3 – How to ensure the appropriate knowledge level for controlling procurement risks	All
16.15	Bringing it all together	Andreas Hartmann
16.30	Closure	

Participants

Name	Organization	Country
Jacob Groenendijk	KOAC NPC	the Netherlands
Arthur van Dommelen	Rijkswaterstaat GPO	the Netherlands
Leland Torgeir	Norwegian Public Roads Administration	Norway
Ben Spiering	Rijkswaterstaat WVL	the Netherlands
Leon van den Bos	Rijkswaterstaat GPO	the Netherlands
Meelis Toome	Estonian Road Administration	Estonia
Dan Eriksson	Trafikverket	Sweden
Erika Avanzi	ANAS SpA	Italy
Robin Hudson	Highways England	UK
Gerbert van Bochove	Heijmans Infra	the Netherlands
Ad Heystek	IV-Infra	the Netherlands
Bart Mante	DHV	the Netherlands
Kai Giese	Oranje adviseurs	the Netherlands
Berwick Sluer	Boskalis	the Netherlands
Robbert Naus	Dura Vermeer	the Netherlands
Andreas Hartmann	University of Twente	the Netherlands
Jens Roehrich	University of Bath, School of management	United Kingdom
Rainer Hess	Durth Roos	Germany
Juha Äijö	Rambol	Finland
Monica Altamirano	Deltares	the Netherlands
Thomas Bles	Deltares	the Netherlands

Annex II – Risks per category

Strategy	Risks
B	<p>By outsourcing single maintenance tasks separately, increased effort is required to align and coordinate maintenance activities. This may lead to problems if capabilities are not present at the contracting agency.</p> <p>Materials and technology used in short term contracts have no optimal durability.</p> <p>Area knowledge is not transferred between contractors. The contract is handed over to the new contractor when the contract ends.</p> <p>Risk for in-house activity is that we keep the responsibility, but get less and less possibility to actually do it. For example, less budget to keep leading innovative techniques.</p> <p>Too short contract periods, contractor not allowed to write down investments, staff on the contract need time to perform according to contracts.</p> <p>From a LCC perspective it may be more lucrative to carry out preventive maintenance, however when the contractor is only obliged to execute certain tasks when a certain condition has been reached, this may affect the life cycle of the asset adversely.</p> <p>Risk for outsourced activities is that they do not get cheaper and cheaper, or broader available, but actually need more and more investment to keep them up to the quality level that we think is necessary.</p> <p>Contracts will be more expensive, because contractor is not sure about the future contracts (will be there any?) and would not invest in new equipment.</p> <p>Extra hamper. Contractors operate at different times.</p> <p>The NRA has less and less specialists to check whether the contractor will deliver as been asked.</p> <p>Combination of activities is not possible. Risk for more hamper and extra costs.</p> <p>Every contractor develops its own knowledge base (persons) resulting in a distribution of the existing knowledge over many parties not wanting to share the knowledge because of perceived competition advantages.</p> <p>Deep operational knowledge and system integration skills are necessary to make this model work. Either in house or by engaging a separate managing agent. If this role is not organized cost goes up and functionality goes down.</p> <p>Contracts will be more expensive.</p> <p>We are currently trialling strategy B in one area of our network this was only implemented in July 2016. We refer to this as ALDM (Asset Led Delivery Model).</p>
C	<p>The contractor loses interest in carrying out maintenance tasks when the costs he has made start to reach the agreed fixed price.</p> <p>Level of technical expertise required to realize these activities may be even higher than those of strategy B, based on extensive hands on experience.</p>

The payment mechanism can create an incentive to "do the wrong things", i.e. that creates the largest numbers on the bottom line, not necessarily the activities which are needed to be carried out. Sometimes they won't do activities which they are required to do because the activity itself will result in a financial loss.

Lump sum will create an incentive "to do as little as possible" and get away with it. Creates a large need for activities on behalf of the NRA to check if work is done according to specs. The contractor will not report faults under such a scheme.

Risk for all performance specifications is that they will always have empty space in between the lines. For the right interpretation of the specs, knowledge is necessary.

Fixed price in combination with long term and more integrated contract introduce the risk of loss of quality and default.

The contractor may speculate that certain failures or shortcomings will only come to the surface after the end of the contract.

Not enough knowledge at the RA to manage this strategy, because contractors are not challenged to deliver more value than specified. It is the full responsibility of the RA to optimize every new contract based on own knowledge and experience.

Competition between contractors resulting in less value for less money and dropping maintenance standards.

Risk of not being able to specify technical criteria to check on realisation of technical design life shortly after completion of the maintenance work. How to assure a service life, without actually choosing a contract of the same length.

Payment not being linked to global performance of maintenance (numbers of alarms, reducing costs of annual maintenance, ...) but only to time expired.

Innovative techniques with benefits outside of the contract specifications are not used.

Mostly the specifications lead to a lot of paperwork on both sides, that will not lead to better roads in the end.

If the way to pay the contractor does not contain incentives to find new ways to maintain, new equipment and ways to use them will light with its absence.

Deep operational knowledge and system integration skills are necessary to make this model work. Either in house or by engaging a separate managing agent. If this role is not organized cost goes up and functionality goes down.

Some activities are difficult to specify according to performance specifications, for instance litter control. When are specifications met, and not? Sometimes frequencies of such activities must be specified, for instance one inspection per week where picking of litter takes place.

Structural quality may deteriorate imperceptibly, without visible signs of distress.

Newly developed technologies (materials and application technics) are not allowed in specifications, which are based on existing State of the Art.

A strong bias on staff reduction and process optimization by introducing guidelines and standards makes the organization rigid.

If the contractor is 1 company to address to, or seeing the site of the project, this

	<p>will be a combination of contractors, which you have to be in contact with.</p>
D	<p>Level of technical expertise required to realize these activities may be even higher than those of strategy A, based on extensive hands on experience.</p> <p>Pricing mechanism may cause undesired behaviour of contractor. Contractor will benefit by looking at ways to maximise the number of units (e.g. maintenance tasks) being executed. Resulting in increased costs and activities.</p> <p>Competition between contractors resulting in less value for less money and dropping maintenance standards.</p> <p>Every contractor develops its own knowledge base (persons) resulting in a distribution of the existing knowledge over too many parties giving not enough incentives and/or options to develop new knowledge.</p> <p>Risk of not being able to specify technical criteria to check on realisation of technical design life shortly after completion of the maintenance work. How to assure a service life, without actually choosing a contract of the same length.</p> <p>Payment not being linked to global performance of maintenance (numbers of alarms, reducing costs of annual maintenance, ...) but only to time expired.</p> <p>New competences to manage the interface with the contractor on the level of asset management will not be (timely) available.</p> <p>Mostly the specifications lead to a lot of paperwork on both sides, that will not lead to better roads in the end.</p> <p>Lack of communication between the various contractors lead to task that are not conducted at all or are done more than once.</p> <p>Unrealistically high specifications for availability, not leaving time for proper maintenance.</p> <p>Extra hamper. Contractors operate at different times.</p> <p>Frequent monitoring by contract agency is expensive (internal costs).</p> <p>Too many and too complicated performance specifications and 'special rules'.</p> <p>Random intervals imply there is a chance that faults or shortcomings remain undetected.</p> <p>Every contractor develops its own knowledge base (persons) resulting in a distribution of the existing knowledge over many parties not wanting to share the knowledge because of perceived competition advantages.</p> <p>With increased size of the contract, consequences of a defaulting contractor will leave a big gap in service provision. There is a high dependency on one service provider for a large part of the infrastructure. Such a gap is not quickly filled (e.g. by a new contracting procedure).</p> <p>Long-term contracts introduce the risk of not being able to introduce new policies.</p> <p>Most contractors just gained their knowledge about maintenance in the last years (or not yet at all) Therefore, they cannot oversee the consequences for taking up long term maintenance contracts. The knowledge mostly is in the hands of the NRA's; how to get this open to the contractors.</p> <p>The performance specifications are not really measurable (comfort of the road,</p>

	<p>quantity of the grass, are not good specifications).</p> <p>Risk of not being able to define the "cost" if agency has little technical and hands on experience.</p> <p>Risk for all performance monitoring is the thoroughness with which we monitor. In other words, the quality with which we monitor. If monitoring itself is restricted in capacity/money/effort, then it is less useful than necessary. For example, do we know how many quality guaranty issues are actually running? How many?</p> <p>There will be problems when contractor made a mistake in maintenance cost calculations.</p> <p>The contractor goes bankrupt during the contract.</p> <p>Extra management costs by contract agency.</p> <p>A too long contract may present a legal challenge, 5 years usually ok, but 8-10 yrs need some extra argument according to law (EU law?)</p>
All	<p>Contract duration may not align to the duration on which proper maintenance strategies can be employed. Contractor decisions are based on maximizing benefits (profit?) within the contract scope while asset performance may benefit from other durations.</p> <p>No common or generally accepted systems, tools or guidelines for objective appreciation of the performance of the contractor.</p> <p>A risk is that, rather than evaluating the tender, you end up evaluating the writing skills of the party that submitted the tender.</p> <p>Some aspects of quality, e.g. sustainability, are still hard to assess quantitatively and reliably.</p> <p>Low price is a benefit on short term. Risks increase regarding quality and will be more costly on the long term.</p> <p>There is no balance what so ever between scope, quality of asset information, required performance and handover requirements to choose the right strategy for procurement.</p> <p>Quality assurance based on the principle that the contractor carries the burden of proof. We need specifications on how the contractor will prove that specifications are met.</p> <p>Contract obligations for the contractor are not enforced due to the fact that the asset manager (NRA) or its consultant do not have enough (specific) knowledge to see the contract deviations and/or focus on process tests instead of product tests.</p> <p>Tender evaluation choices are determined by corporate policy while not being appropriate for the project/situation. This may lead to poor solutions.</p> <p>Possibility to get good condition history through the contract related to performance monitoring.</p> <p>Lack of quality in deliverables, if principal lacks the competence to detect such lack.</p> <p>We need standard specification of activities as a CEN code that can be used for common activities. This should be associated with how the contractor proves that he needs the criteria.</p>

	<p>Functional performance criteria cannot be measured directly resulting in discussions Client - Contractor/Consultant.</p> <p>Long term contracts need a long term contract administration.</p> <p>Risk for all contract durations is that they end and Rijkswaterstaat will keep being responsible.</p> <p>Due to lack of direct responsibility and/or connection to the work outside people in the organisation become less competent in the tasks and activities set for them.</p> <p>Inspections made by incompetent personnel resulting in 'fake' compliancy to contract standards.</p> <p>Too long contracts, the market may be depleted, i.e. no contractors present in the market next time because they operate other places. A contractor may also be a "prisoner" in a contract which does not generate profit, will try to perform under the requirements, or go bust. If they go bust during the contract, this will cause serious problems on the road until a new contractor is found.</p> <p>The quality standards are set too high in the relation to cost/benefits.</p> <p>Tender evaluation should fit the new procurement models, a hybrid of old and new selection and award criteria won't work.</p> <p>Inspections made by incompetent personnel resulting in 'fake' compliancy to contract standards.</p> <p>Lack of technical knowledge leads to wrong contract or guarantee duration.</p> <p>Knowledge at the RA is outdated for proper specifications.</p> <p>Specified minimum requirements (in writing) by policymakers is not what the operational employees at the RA have in mind.</p> <p>Too much distance between the site of work and the enterprise site.</p> <p>Too high minimum payment avoids small medium enterprises to tender.</p> <p>No adequate measures for human induced errors in performing the maintenance.</p>
--	---

Annex III – Ranking risks

Nr	Rating item	1	2	3	4	5	ϕ	SD	$SD \geq 0,3$	n
1	Contract duration may not align to the duration on which proper maintenance strategies can be employed. Contractor decisions are based on maximizing benefits (profit?) within the contract scope while asset performance may benefit from other durations.	7	4	0	1	0	1,58	0,22		12
2	No common or generally accepted systems, tools or guidelines for objective appreciation of the performance of the contractor.	6	2	3	0	0	1,73	0,22		11
3	By outsourcing single maintenance tasks separate, increased effort is required to align and coordinate maintenance activities. This may lead to problems if capabilities are not present at the contracting agency?	5	5	1	1	0	1,83	0,22		12
4	The contractor loses interest in carrying out maintenance tasks when the costs he has made start to reach the agreed fixed price.	6	6	1	0	1	1,86	0,26		14
5	Level of technical expertise required to realize these activities may be even higher than those of strategy A, based on extensive hands on experience.	6	1	0	1	1	1,89	0,36	x	9
6	The payment mechanism can create an incentive to "do the wrong things", i.e. that creates the largest numbers on the bottom line, not necessarily the activities which are needed to be carried out. Sometimes they won't do activities which they are required to do because the activity itself will result in a financial loss.	4	5	1	1	0	1,91	0,22		11
7	A risk is that, rather than evaluating the tender, you end up evaluating the writing skills of the party that submitted the tender.	4	5	3	0	0	1,92	0,19		12
8	Some aspects of quality, e.g. sustainability, are still hard to assess quantitatively and reliably.	3	9	2	0	0	1,93	0,15		14
9	Materials and Technics used in short term contracts have no optimal durability.	5	6	2	1	0	1,93	0,22		14
10	Lump sum will create an incentive "to do as little as possible" and get away with it. Creates a large need for activities on behalf of the NRA to check if work is done according to specs. The contractor will not report faults under such a scheme.	7	4	1	1	1	1,93	0,31	x	14
11	Low price is a benefit on short term. Risks increase regarding quality and will be	4	5	4	0	0	2,00	0,20		13

Nr	Rating item	1	2	3	4	5	ϕ	SD	$SD \geq$	n
		0,3								
	more costly on the long term.									
12	There is no balance what so ever between scope, quality of asset information, required performance and handover requirements to choose the right strategy for procurement.	5	4	3	1	0	2,00	0,24		13
13	Area knowledge is not transferred between contractors the contract is handed over to the new contractor when the contract ends.	6	4	2	2	0	2,00	0,27		14
14	Risk for all performance specifications is that they will always have empty space in between the lines. For the right interpretation of the specs, knowledge is necessary.	5	4	1	2	0	2,00	0,27		12
15	Quality assurance based on the principle that the contractor carries the burden of proof. We need specifications on how the contractor will prove that specifications are met.	5	5	2	0	1	2,00	0,28		13
16	Pricing mechanism may cause undesired behavior of contractor. Contractor will benefit by looking at ways to maximize the number of units (e.g. maintenance tasks) being executed. Resulting in increased costs and activities.	5	4	2	0	1	2,00	0,29		12
17	Risk for in-house activity is that we keep the responsibility, but get less and less possibility to actually do it. For example less budget to keep leading innovative techniques.	3	6	4	0	0	2,08	0,18		13
18	Fixed price in combination with long term and more integrated contract introduce the risk of loss of quality and default.	4	4	3	1	0	2,08	0,24		12
19	The contractor may speculate that certain failures or shortcomings will only come to the surface after the end of the contract.	4	7	0	1	1	2,08	0,29		13
20	Not enough knowledge at the RA to manage this strategy, because contractors are not challenged to deliver more value than specified. It is the full responsibility of the RA to optimize every new contract based on own knowledge and experience.	6	4	1	0	2	2,08	0,35	x	13
21	Contract obligations for the contractor are not enforced due to the fact that the asset manager (NRA) or its consultant do not have enough (specific) knowledge to see the contract deviations and/or focus on process tests instead of product tests.	5	5	0	0	2	2,08	0,35	x	12
22	Too short contract periods, contractor not allowed to write down investments, staff	4	5	0	1	1	2,09	0,31	x	11

Nr	Rating item	1	2	3	4	5	ϕ	SD	$SD \geq$	n
		0,3								
	on the contract need time to perform according to contracts.									
23	Tender evaluation choices are determined by corporate policy while not being appropriate for the project/situation. This may lead to poor solutions.	4	4	2	2	0	2,17	0,27		12
24	Possibility to get good condition history through the contract related to performance monitoring.	3	5	2	0	1	2,18	0,28		11
25	Lack of quality in deliverables, if principal lacks the competence to detect such lack.	4	4	1	1	1	2,18	0,32	x	11
26	We need standard specification of activities as a CEN code that can be used for common activities. This should be associated with how the contractor proves that he needs the criteria.	4	1	4	1	0	2,20	0,27		10
27	Competition between contractors resulting in less value for less money and dropping maintenance standards.	5	5	3	1	1	2,20	0,29		15
28	From a LCC perspective it may be more lucrative to carry out preventive maintenance, however when the contractor is only obliged to execute certain tasks when a certain condition has been reached, this may affect the life cycle of the asset adversely.	1	9	4	0	0	2,21	0,14		14
29	Random controls tenders in real time to be more scheduled. The bought quality risks are not fulfilled on "not scheduled" time.	1	5	3	0	0	2,22	0,16		9
30	Every contractor develops its own knowledge base (persons) resulting in a distribution of the existing knowledge over too many parties giving not enough incentives and /or options to develop new knowledge.	6	3	9	1	0	2,23	0,24		19
31	Risk of not being able to specify technical criteria to check on realization of technical design life shortly after completion of the maintenance work. How to assure a service life, without actually choosing a contract of the same length.	3	5	3	0	1	2,25	0,27		12
32	Payment not being linked to global performance of maintenance (numbers of alarms, reducing costs of annual maintenance, ...) but only to time expired.	5	2	2	3	0	2,25	0,31	x	12
33	Risk for outsourced activities is that they do not get cheaper and cheaper, or broader available, but actually need more and more investment to keep them up to the quality level that we think is necessary.	5	2	2	3	0	2,25	0,31	x	12
34	Functional performance criteria cannot be measured directly resulting in discussions Client - Contractor/Consultant.	2	5	3	1	0	2,27	0,22		11

Nr	Rating item	1	2	3	4	5	Ø	SD	SD ≥ 0,3	n
35	Innovative techniques with benefits outside of the contract specifications are not used.	3	4	2	2	0	2,27	0,26		11
36	New competences to manage the interface with the contractor on the level of asset management will not be (timely) available.	1	7	1	0	1	2,30	0,25		10
37	Mostly the specifications lead to a lot of paperwork on both sides, that will not lead to better roads in the end.	4	1	8	0	0	2,31	0,23		13
38	Long term contracts need a long term contract administration.	2	7	3	0	1	2,31	0,25		13
39	Risk for all contract durations is that they end and Rijkswaterstaat will keep being responsible.	2	5	4	1	0	2,33	0,21		12
40	Lack of communication between the various contractors lead to tasks that are not conducted at all or are done more than once.	2	6	3	0	1	2,33	0,26		12
41	Unrealistically high specifications for availability, not leaving time for proper maintenance.	3	4	3	2	0	2,33	0,26		12
42	Due to lack of direct responsibility and/or connection to the work outside people in the organization become less competent in the tasks and activities set for them.	4	3	2	3	0	2,33	0,29		12
43	Contracts will be more expensive, because contractor is not sure about the future contracts (will be there any?) and would not invest in new equipment.	5	4	2	4	0	2,33	0,30	x	15
44	Extra hamper. Contractors operate at different times.	2	5	5	1	0	2,38	0,21		13
45	Inspections made by incompetent personnel resulting in 'fake' compliancy to contract standards.	3	5	3	1	1	2,38	0,29		13
46	Too long contracts, the market may be depleted, i.e. no contractors present in the market next time because they operate other places. A contractor may also be a "prisoner" in a contract which does not generate profit, will try to perform under the requirements, or go bust. If they go bust during the contract, this will cause serious problems on the road until a new contractor is found.	4	4	0	3	1	2,42	0,35	x	12
47	The quality standards are set too high in the relation to cost/benefits.	1	7	5	1	0	2,43	0,18		14
48	Frequent monitoring by contract agency is expensive (internal costs).	3	5	4	1	1	2,43	0,28		14
49	Who will do it? Are there enough staff in the NRA'a.	5	5	1	4	1	2,44	0,33	x	16
50	Tender evaluation should fit the new procurement models, a hybrid of old and new	1	5	4	1	0	2,45	0,20		11

Nr	Rating item	1	2	3	4	5	ϕ	SD	$SD \geq$	n
		0,3								
	selection and award criteria won't work.									
51	The NRA has less and less specialists to check rather the contractor will deliver as been asked.	2	4	4	0	1	2,45	0,27	x	11
52	Too many and too complicated performance specifications and 'special rules'.	4	2	2	2	1	2,45	0,34	x	11
53	Inspections made by incompetent personnel resulting in 'fake' compliancy to contract standards.	2	5	5	0	1	2,46	0,25	x	13
54	Random intervals imply there is a chance that faults or shortcomings remain undetected.	1	5	5	1	0	2,50	0,19		12
54	If the way to pay the contractor does not contain incentives to find new ways to maintain, new equipment and ways to use them will light with its absence.	2	5	3	1	1	2,50	0,28		12
55	Combination of activities is not possible. Risk for more hamper and extra costs.	2	3	4	0	1	2,50	0,28		10
56	Every contractor develops its own knowledge base (persons) resulting in a distribution of the existing knowledge over many parties not wanting to share the knowledge because of perceived competition advantages.	2	3	4	0	1	2,50	0,28		10
57	Lack of technical knowledge leads to wrong contract or guarantee duration.	2	6	1	2	1	2,50	0,30	x	12
58	Deep operational knowledge and system integration skills are necessary to make this model work. Either in house or by engaging a separate managing agent. If this role is not organized cost goes up and functionality goes down.	3	2	2	3	0	2,50	0,30	x	10
59	Knowledge at the RA is outdated for proper specifications.	4	4	2	3	1	2,50	0,32	x	14
60	With increased size of the contract, consequences of a defaulting contractor will leave a big gap in service provision. There is a high dependency on one service provider for a large part of the infrastructure. Such a gap is not quickly filled (e.g. by a new contracting procedure).	4	2	3	2	1	2,50	0,33	x	12
61	Long-term contracts introduce the risk of not being able to introduce new policies.	2	3	7	1	0	2,54	0,21		13
62	Most contractors just gained their knowledge about maintenance in the last years (or not yet at all) Therefore, they cannot oversee the consequences for taking up long term maintenance contracts. The knowledge mostly is in the hands of the NRA's; how to get this open to the contractors.	2	5	4	1	1	2,54	0,27		13
63	The performance specifications are not really measurable (comfort of the road,	4	2	4	2	1	2,54	0,32	x	13

Nr	Rating item	1	2	3	4	5	ϕ	SD	$SD \geq$	n
		0,3								
64	quantity of the grass, are not good specifications).									
64	Some activities are difficult to specify according to performance specifications, for instance litter control. When are specifications met, and not? Sometimes frequencies of such activities must be specified, for instance one inspection per week where picking of litter takes place.	1	6	2	3	0	2,58	0,24		12
65	Risk of not being able to define the "cost" if agency has little technical and hands on experience.	1	6	3	3	0	2,62	0,23		13
66	Risk for all performance monitoring is the thoroughness with which we monitor. In other words, the quality with which we monitor. If monitoring itself is restricted in capacity/money/effort, then it is less useful than necessary. For example, do we know how many quality guaranty issues are actually running? How many?	1	6	4	1	1	2,62	0,25		13
67	There will be problems when contractor made a mistake in maintenance cost calculations.	4	2	3	3	1	2,62	0,33	x	13
68	The contractor goes bankrupt during the contract.	7	0	5	0	4	2,63	0,40	x	16
69	Structural quality may deteriorate imperceptibly, without visible signs of distress.	2	4	4	0	2	2,67	0,31	x	12
70	New developed technologies (materials and application technics) are not allowed in specifications, which are based on existing State of the Art.	3	3	2	3	1	2,67	0,33	x	12
71	Extra management costs by contract agency.	1	4	6	2	0	2,69	0,21		13
72	Specified minimum requirements (in writing) by policymakers is not what the operational employees at the RA have in mind.	1	3	1	1	1	2,71	0,32	x	7
73	A too long contract may present a legal challenge, 5 years usually ok, but 8-10 yrs need some extra argument according to law (EU law?)	3	4	1	3	2	2,77	0,36	x	13
74	Contracts will be more expensive.	2	4	4	3	1	2,79	0,29		14
75	A strong bias on staff reduction and process optimization by introducing guidelines and standards makes the organization rigid.	2	2	2	4	0	2,80	0,29		10
76	Too much distance between the site of work and the enterprise site.	2	3	3	1	2	2,82	0,33	x	11
77	If the contractor is 1 company to address to, or seeing the site of the project, this will be a combination of contractors, which you have to be in contact with.	1	1	3	2	0	2,86	0,25		7
78	Too high minimum payment avoid small medium enterprises to tender.	1	2	5	1	1	2,90	0,26		10

Call 2014: Asset Management and Maintenance

Nr	Rating item	1	2	3	4	5	ϕ	SD	$SD \geq$	n
		0,3								
79	No adequate measures for human induced errors in performing the maintenance.	0	2	3	3	1	3,33	0,24		9
80	We are currently trailing strategy A in one area of our network this was only implemented in July 2016. We refer to this as ALDM (Asset Led Delivery Model).	0	0	1	0	1	4,00	0,25		2