

Stimulating Public-Private Cooperation for the Strategic Replacement of Infrastructure Assets in the Netherlands

The Role and Formulation of Public-Private Arrangements



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Stimulating Public-Private Cooperation for the Strategic Replacement of Infrastructure Assets in the Netherlands

The Role and Formulation of Public-Private Arrangements

By

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“Wind extinguishes a candle and energizes fire. Likewise with randomness, uncertainty, chaos: you want to use them, not hide from them. You want to be the fire and wish for the wind.”

-Nicholas Nassim Taleb-

Preface and Acknowledgements

What started as a first, explorative conversation on a remarkably warm Thursday afternoon in November in a coffee bar near Rotterdam Central Station, has now evolved into a complete master thesis report. After six months of full time work on my master thesis I look back with gratitude and joy, but also with a slight hint of relief. The past half year was a real journey: exploring new things, sometimes getting lost, but always able to get back on track, while never leaving the end destination out of sight.

At this place I would like to thank all people who made it possible to achieve this result, but some people in particular. First of all, my graduation committee. Geert, for providing me the opportunity to execute my research at Antea Group, for the diversity of contacts I could use for my interviews, for reviewing intermediate versions and for all the interesting discussions on infrastructure replacement. Joris, for introducing me to the contracting department at Antea, for making your expertise on public private partnerships available and for all your practical and substantive advices during the feedback meetings and for your help to find respondents. A massive thanks to Bertien, for all those productive feedback meetings, for leading me back to the way when I was lost or seem to get lost, but above all for letting me make my own choices in shaping my own research. Tineke, thank you for your critical reflections on my work, emphasizing the need of a structured research approach and forcing me rethink my choices and demarcation for the better. Ernst, I am grateful for your sharp and frank, substantiating comments and suggestions during the kick-off and greenlight meetings. Furthermore, I would like to thank all respondents for participating in this research. Thanks for 'giving' your time and openness during the interviews. My further gratitude goes out to my parents for supporting me during my studies and providing me the opportunity to study. Finally, Emily, thanks for all your unconditional support, love, patience, bringing and keeping me down to earth.

Readers that are interested in the concept of public private arrangements that is used in this research, I refer to section 2.2. For those interested in public private arrangements (partnerships) I can recommend chapter 3. This chapter also provides an operationalization of public private arrangements, which takes the form of a framework. Readers interested in the asset management part of strategic infrastructure replacement are referred to chapter 4. Chapter 4 also provides the asset management replacement, which contains all replacement tasks. This framework is used as a basis for the public private task allocation and the identification of replacement roles. Those interested in the replacement context in the Netherlands, I refer to chapter 5. Readers that would like to see a good example of a strategic replacement challenge and the added value of public private arrangements I refer to chapter 6. Readers with little time are referred to the executive summary which starts on the next page.

*Patrick van der Beek
Krimpen aan den IJssel, August, 2015*

Executive Summary

After decades of infrastructure expansion the Dutch national infrastructure manager Rijkswaterstaat is preparing the replacement of all 654 water infrastructure assets in the Netherlands. Replacement is essentially different from infrastructure construction in that it provides opportunities for redesign of infrastructure networks and as such requires making long-term oriented (strategic) decisions that cover the network level as a collection of interconnected assets. Market parties can potentially contribute to replacement by providing innovative solution, cost efficiency and added value (quality). Thereby it is important to arrange this market involvement carefully, otherwise these benefits will not materialize or market involvement may even turn out negatively, resulting in cost overruns, delayed delivery and low quality projects. Given the newness of replacement and the lack of project overarching public-private arrangements, it is not known how to shape the client-contractor relation, such that the potential benefits may materialize. Hence the following research question can be formulated: *“To what extent can market parties play a role in the strategic replacement of infrastructure and which public-private arrangement need to be used accordingly?”*

In order to arrive at an answer to this question, literature studies into the field of public-private partnerships, public-private cooperation and asset management have been executed, which resulted in the operationalization of the client – contractor relation (arrangement framework), an overview of all tasks required for efficient infrastructure management (infrastructure management framework) and the identification of replacement tasks and efficient bundling of these tasks. Explorative, semi-structured interviews have been held to determine public-private task allocation within the context of (strategic) infrastructure replacement in the Netherlands. These have been combined with public-private arrangements and as such formed three (preliminary) alternatives, which were in turn tested at a single case study Stuwten Maas. The results of the case study are validated by an evaluation session which took the setting of a focus group.

Replacement tasks and roles

Replacement has a high impact on current and functioning and performance of the local infrastructure network, hence touches the interests of a variety of stakeholders and local infrastructure managers. Efficient replacement requires both stakeholder management and system management. Due to both the interconnection of asset performance and infrastructure management tasks, a network approach to management of assets is considered beneficial, which results in the following four replacement roles, each representing a bundle of replacement tasks:

1. Stakeholder involvement: Identification and prioritization of stakeholder needs with regard to intervention decisions: maintenance planning, ‘redesign’ of the network, design of the new objects.
2. Internal coordination: coordinating of infrastructure intervention activities in order to optimize network performance: maintenance, design, replacement, and construction.
3. External coordination: coordinating the network under consideration with external networks.
4. Synchronization: coordination of intervention activities with local infrastructure managers.

An operationalization of public – private arrangements

Based on literature on public-private partnerships and public private cooperation, an arrangement framework is formulated, which operationalizes a public private arrangement by means of elements, which can be considered building blocks:

1. Participating parties: the number of arrangement participants and the numerical ratio of public – private participants.
2. Relationship inter parties: the authority relation(s) between the arrangement parties and the degree of coordination and interaction between them.
3. Degree of formality: indicates how formal the agreement is, including allocation of resources.
4. Degree of flexibility and ownership: the degree of flexibility of the initial formulated scope, result and agreement duration.
5. Responsibility division: reward and resource allocation distribution and decision making responsibility between the arrangements participant.

Research findings (conclusion)

In general, market involvement in strategic infrastructure replacement is considered to be beneficial. With regard to the preferences for public-private allocation of replacement tasks a 'tripartition' becomes visible. Market parties are considered to best fulfil the operational tasks, both with regard to the management of the objects and network itself, such as maintaining, designing, construction, and monitoring and evaluation of performance. When it comes to the 'real' replacement tasks, a joint approach it is advised. This applies to determination of the investment need based on the performance target, determining the replacement moment and strategy and stakeholder involvement. The 'strategic' decision making responsibility involved in replacement should be kept in public hands, as a result of the importance for society and the expected conflict of market values with public values (i.e. profit vs. societal optimum). These strategic tasks concern the formulation of network performance targets and formulation of acceptable risk levels. Market parties can play an advisory role in these strategic tasks, however the end responsibility should lie with the client.

The arrangements to be preferably used resemble long term, flexible arrangements with a general initial scope, result description, expressed in performance targets, and time duration. Long-term arrangements can be advantageous, since they 'force' the contractor to continuously optimize the performance of the asset(s) and are considered to be more effective within a replacement setting: they enable the contractor to get to know the network and hence can develop a more efficient replacement strategy. The preferences for a collaborative approach come to expression in a general scope, time duration and result that is further specified along the way, by means of intermediate evaluation moments, which also serve as opportunities to adapt to external factors. The arrangement mainly fulfils a facilitative role: it sets the boundaries of the project with regard to performance, allocation of resources, responsibility division, and control, interaction and coordination mechanisms. To this extent the arrangement becomes a mechanism that sets the communication and interaction procedures (i.e. intermediate evaluation and performance adaptations), arranges the process of further specification of the replacement strategy, and provides 'exit options' in case the cooperation does not work out as intended. It tries to prevent the downsides of a full cooperative like setting (harming trust), and tries to catch the upsides. The long timespan is beneficial for stimulating innovation, the need for mutual consent for preventing strategic behaviour. In case of underperformance hierarchical intervention by the client should always be possible.

The public-private arrangements and public-private task division presented above have much potential, however the benefits cannot be taken for granted. Evaluation of the first public-private partnerships both in the Netherlands and abroad has brought less beneficial effects than initially expected. Besides, the current 'institutional setting' in the Netherlands is still based on competitive tendering procedures, and is highly price-oriented. The mechanisms conflict contrast with the cooperative setting (i.e. a stable mutual trust relation) required to let the arrangements succeed. Stated differently, sufficient institutional capacity needs to be built in order to develop a trust like relationship that will increase the opportunity of the materializing of the potential benefits of long term, general and flexible arrangements. Furthermore, the success of the arrangement depends on the commitment of both contractors and client. Contractors also need to innovate and take risks. On top of that, performance based governance need to be faultlessly implemented by the client.

There is no single right approach to managing strategic replacement effectively, as a result of several trade-offs that play a role. Rijkswaterstaat has to face these trade-offs and need to choose deliberate which values to prefer. First, Rijkswaterstaat need to choose between control and freedom: freedom stimulates the willingness to innovate and 'own initiative' of the contractor, while control is necessary to prevent disruptions to occur and manage them effectively in case they might occur. Closely related is the second choice: a vertical (hierarchical) client – contractor relation or an equal, horizontal (partner) relationship. Hierarchical interventions are required in case the contractor underperforms, while a horizontal relationship leads to more freedom and more creativity. Third, quality and innovation. Innovation requires freedom and stimulating incentives, while quality requires close involvement of stakeholders, hence limits the freedom. It is important these choices are consistent and as such lead to a sustainable result, because only then a stable contractor client relation can be developed. This brings us to the recommendations.

Recommendations

Performance based governance plays an essential role in the preferred public-private arrangements that are preferred. Especially the initial performance targets at the start of a long term arrangement can be determining for the ‘further’ development of the cooperation. As such, *performance measurement should be the new core business of Rijkswaterstaat*: providing the contractors with the performance targets they need to fulfil in accordance with their task. These performance targets should be smartly combined with the incentives (i.e. reward & cost division) and the remaining arrangement values: agreement duration, (end) result and scope in particular.

This brings us to the second recommendation: *develop system knowledge and a clear vision on the future*. No matter how much tasks are handed over to market parties, system knowledge will stay an essential skill for the client. System knowledge will enable the client to formulate realistic and effective performance goals, evaluate the performance of the contractor(s) and have a decisive vote in determining the future design of the network. This vision on the future needs to entail the required performance levels, prioritizing of network functions on a national level (project overarching) and as such can serve as a first step in the (national) replacement process. Furthermore, the ‘view’ on the future also embraces a strategic view on the public – private role division. Choices need to be made as to how to coordinate performance of networks and between networks: central or decentral? How to ‘stay in control’ of critical operational processes? To what extent should stakeholder involvement and prioritization be handed over to market parties? Furthermore, it is important to make a clear role and responsibility division, such that market parties can develop the required skills and as such anticipate on their future role.

This makes a bridge to the third recommendation: *build institutional capacity by bundling forces smartly, focused on cooperation*. Further development institutional capacity is required to realize sustainable cooperation and to capture the benefits of cooperation, without experiences the downsides. Three aspects are required for this: stimulating social capacity (cooperation) by creating long term trust relationships. Increasing intellectual capacity by means of transfer and developing relevant knowledge. Improving political capacity by a clear, fair and effective public-private role division (who makes which decisions, who is responsible for what). It needs no further explanation that this requires a dominant role of the client.

This brings us to the fourth recommendation: *further develop (specify) long term arrangements which stimulate cooperation*. Long-term, flexible and general arrangements that are considered beneficial for strategic infrastructure replacement need further specification in order to be implementable. This concerns both the arrangement itself as the ‘early involvement phases’ in which contractors are selected and in which client and contractor(s) establish the general end result, scope, time duration and allocation of resources. Quality and innovation should be stimulated from the very start. It is recommended to develop clear procedures up front, with regard to intermediate evaluation and specification, a clear responsibility division and clear agreements in order to prevent conflicts during the execution of the arrangement itself. The use of adaptive pathways may be of value here. Further specification is furthermore advised concerning the incentive structure in order to safeguard the ‘cooperative spirit’ by aligning goals. Research to this new arrangement should be initiated as early as possible, since the development of sufficient institutional capacity required for beneficially implement this kind of arrangements requires a significant amount of time.

Recommendations for further research

The main aim of this research was to generate explorative public-private arrangements as starting point for more elaborate designs, such as formulation of matching contracts. First, it must be stated that the effects of arrangements are based on expectations. Further research is required to the validation of these results. Especially the effect of arrangement values, such as (a flexible) scope, agreement duration and end result on arrangement effects (i.e. costs, innovation and network quality) deserve further research. Also the incentives structures to be used in long-term arrangements require further research in order to keep both public and private goals aligned during long-term agreements. The intermediate evaluation moments may play a key role to this extent. The use of serious games and simulation may be of great help here, since the effect of public private arrangements is to a large extent dependent on the attitude of the cooperation parties. A second suggestion concerns the generalizability of these findings to other infrastructure sectors and countries. Third, further research is required to the legal implications of the arrangements: are they feasible from a legal point of view? Fourth, special attention needs to be paid to an assessment framework for arrangement selection and partner selection, besides the expected effects on project outcomes (costs, innovation and network quality). Outcomes are highly uncertain, while intermediate evaluation processes and contractor behaviour may have significant influences on the end result.

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1. Introduction

1.1 Introduction: a replacement challenge lies ahead

During the 1930s, 40s and 50s most of the water infrastructure assets¹ were constructed in the Netherlands. In the decades to come these assets reach the end of their lifetime (figure 1), thereby leaving Rijkswaterstaat puzzled as to what to do.² Intervention decisions need to be made in order to prevent malfunctioning. As the infrastructure manager of 654 ‘water construction works’ the expected replacement value Rijkswaterstaat has to invest can reach several hundreds of million euro’s a year. This covers a significant part of the total annual budget of approximately €5 billion, of which approximately €1 billion is meant for construction and management of infrastructure (Rijkswaterstaat, 2012a). In the light of this upcoming replacement Rijkswaterstaat is preparing a pro-active replacement approach in order to ‘streamline’ the replacement from a financial perspective, and to have a clear ‘image’ of the replacement challenge that lies ahead.³ After decades of infrastructure expansion this large sized replacement need can be seen as one of the largest challenges Rijkswaterstaat has faced.

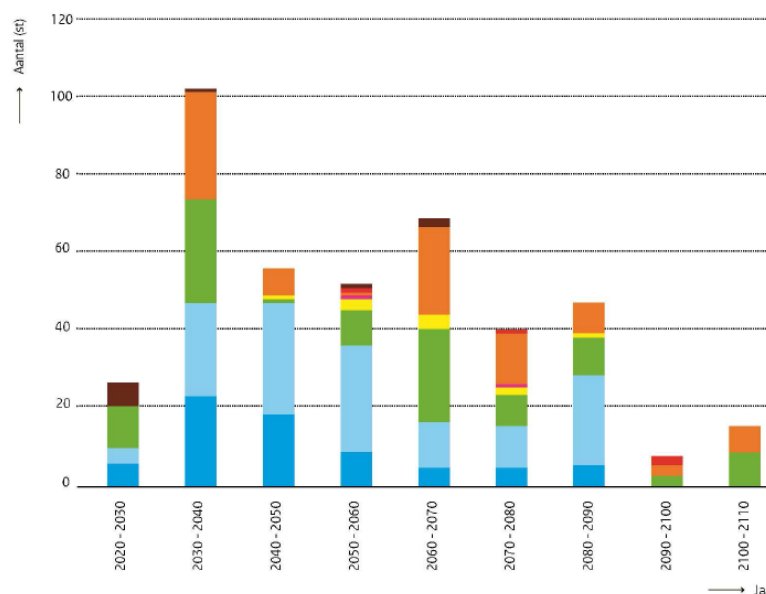


Figure 1 Overview of estimated replacement moment of water infrastructure assets (adapted from Ministerie van Infrastructuur en Milieu & Ministerie van Economische Zaken Landbouw en Innovatie, 2012)

1.2 The fascinating context of infrastructure replacement

What makes replacement essentially different from infrastructure extension? First of all, replacing entails intervening in an already existing situation. The assets to be replaced are part of an already existing system (network) and are interconnected with other assets and networks, both with regard to performance as to the functions they fulfil (Herder & Wijnia, 2012). Infrastructure assets, water assets in particular, fulfil a wide variety of functions and their existence touches the interests of many actors, both of a public and private nature (Bus, 2015; Herder & Wijnia, 2012; Hijdra, Arts, & Woltjer, 2014). For example, barrages are part of the waterway network, but also fulfil an important function with regard to safety. Replacing one asset will therefore influence the functioning of other assets

¹ These objects concern the so called ‘natte kunstwerken’: sluices, barrages, (movable) bridges, pumping stations etc. (DHV, 2010).

² Replacement is only one option out of many. Renovation, life expanding maintenance or removing the object are other alternatives. Also several replacement strategies are often feasible. The decision to replace will be elaborated on in section 1.2.

³ Part of this need has come into existence because the Ministry of Infrastructure and the Environment requires Rijkswaterstaat to predict its ‘financial need’, partly because of the expected and experience advantages in terms of costs and quality of the objects (derived from (Rijkswaterstaat, 2010). Antea Group is currently developing and implementing a methodology to deal with the large scale replacement, suited to the Rijkswaterstaat organization.

and the ‘optimal’ replacement moment is difficult to determine (van der Velde, 2015). Second, when replacing one has to deal with the ‘legacy of the past’. Water assets have been over-engineered, hence have very long life times (Ackermans, 2015). The current state, design and state of the object is the result of many years of maintenance activities, which may not be registered adequately. Besides, infrastructure systems have been evolving over time, without a clear master plan (Herder & Wijnia, 2012). Furthermore, water infrastructure assets consist are physically unique and consist of several components and systems, each having their own lifespan, which make it difficult to determine when to replace the complete object (Klatter, 2015), but also to develop uniform designs (Ackermans, 2015).⁴ Knowledge about performance development, maintenance and investment needs is experienced at the operational level (ibid). Third, the need for replacement becomes particularly visible at the operational level: during maintenance and operation activities (van der Velde, 2015) and is often decoupled from use (the user does not complain), while the user needs are important for the determining performance requirements and functionality of the assets (Leendertse, 2015). Replacing the object itself has however important consequences for the user, namely temporal disruptions of service. Finally, public infrastructure remains heavily dependent on public financing (Herder & Wijnia, 2012; Too, 2010). Given the fact that the replacement urgency mainly becomes visible at the operational level and infrastructure budgets in the Netherlands are determined at the political (strategic) level, there is no sense of urgency to ‘free’ much budget (Bus, 2015; Klatter, 2015). Extension of the network is much more appealing to politicians than replacement (Leendertse, 2015).

The large scale of the replacement challenge both in financial and technical respect makes that much is to gain by a proactive approach. Even though the assets only require replacement in 20 years, thinking about replacement now may lead to the realization of effective replacement strategies.⁵ For example, when five similar assets reach the end of their life time at the same moment in time, replacing these assets also provides an opportunity to reconsider the functioning of these assets and even the necessity of having five assets. It will take considerable time to examine alternatives, go through all administrative processes and replace the assets itself. However, this pro-active approach also comes along with many uncertainties. The environmental context of infrastructure assets is highly dynamic, which is reflected in the uncertainty regarding socio-economical and natural developments (Herder & Wijnia, 2012; Schoenmaker, 2011). These uncertainties also need to be accounted for in the design of the new assets.

The strategic nature of large scale infrastructure replacement

The replacement challenge thus covers a long time frame, covers a significant part of the network, entails long-term decision making, and is large in replacement value. Given the importance and impact of the largescale replacement for the functioning of the infrastructure system we can speak of strategic infrastructure replacement. The ‘strategic importance’ of replacement will be point of departure on which this thesis is based. The following strategic decisions come across with replacement:

Strategic Decision 1: What to achieve in the future?

What future functions to prioritize, what performance to require and aim for? This includes dealing with changing external factors and identifying interests of (local) stakeholders (Roovers & van Buuren, 2014).

Strategic Decision 2: To replace or not to replace?

Replacement is a means to achieve future performance amongst other alternatives such as renovation and life-extended maintenance.

Strategic Decision 3: How to replace and what to put in place? (= replacement strategy)

Once replacement has been chosen as ‘the way to go’, the future role (functioning / performance) and design of the assets need to be determined as well as the replacement moment and replacement sequence. For example, one can determine to replace six barrages by four, since the new formulated network design four barrages are sufficient to achieve. The replacement strategy can be considered to be a ‘roadmap’ to the new future, desired situation.

⁴ A bridge with moving part for example consists of a steel construction, mechanical components and concrete. The components each have their own lifecycles. The art of efficient replacement is a right timing, such that the life cycle costs are minimized, while safeguarding the required performance level (Klatter, 2015; van der Velde, 2015).

⁵ For clarity’s sake the term replacement is used for the intervention action that is executed at the end of the objects lifetime. It may also entail other intervention activities, such as life extended maintenance or renovation. A replacement strategy is a pre-defined set of possible intervention activities to be executed within a certain timespan (see DHV, 2010).

1.3 Current practices in infrastructure management in the Netherlands

The replacement challenge takes place in a context where the pressure on infrastructure systems is increasing. Usage of infrastructure systems have increased in the Netherlands; both politicians as the public (citizens) are critically following the performance of the ageing infrastructure systems, and placing ever more emphasis on increasing performance requirements (Wijnia & Herder, 2009). Citizens expect roads to be free of congestion and train systems to be free of disruptions. Politicians expect waterways to deliver high accessibility to the mainports and provide fast transport of goods to the hinterlands. At the same time infrastructure managers have to reach these targets with less budget available (Dominguez, Truffer, & Gujer, 2011). On top of that, infrastructure managers have to oblige the increasing burden of regulatory regimes, mostly stemming from the increased involvement of private parties in providing infrastructure services (Wijnia & Herder, 2009). All these factors place pressure on the management of the infrastructure networks, that is they urge maximizing the performance of these networks, while limiting the use of financial resources. As such, the pressure on making responsible replacements decisions is increasing.

In order to respond to the increased pressure on its infrastructure systems, Rijkswaterstaat adopted asset management as *“the governing approach for infrastructure management”* (van der Velde, Klatter, & Bakker, 2013, p. 341) in 2007. The aim of asset management implementation was to professionalize the infrastructure management processes, but above all to integrate, coordinate and align all activities, by creating a ‘line of sight’ that decomposes the service level agreements made with the Ministry of Infrastructure and the Environment all down to the maintenance activities (ibid). Recent research into the maturity of asset management implementation has showed that since the start of implementation in 2008, asset management practices were mainly practiced at the operational and tactical level (Volker et al., 2013). Currently, the implementation process is still ongoing.

Traditionally, Rijkswaterstaat executed management activities such as maintenance, design and construction of infrastructure itself. Partly forced by the downsizing of the own organisation and partly driven by the perspective of efficiency and quality gains, Rijkswaterstaat has handed over much of its management tasks to market parties in line with the ‘market unless principle’⁶ over the last decade (Rijkswaterstaat, 2010). These tasks differ from relatively ‘simple’ maintenance tasks, until large, integrated construction and replacement projects including the responsibility for maintenance afterwards, the so called Design – Build – Finance – Maintain (DBFM) projects.⁷ Market parties do not only receive more responsibilities, they are also involved ‘earlier’ in the infrastructure planning process by means of market consultations, unsolicited proposals, design contests and market reconnaissance⁸ (Leendertse, Lenferink, & Arts, 2012; Lenferink, Tillema, & Arts, 2013b; van Valkenburg, Lenferink, Nijsten, & Arts, 2008). To this regard the role of Rijkswaterstaat is more and more changing to a public client that tries to cooperate with market parties instead of a public client which simply outsources infrastructure management tasks.

The increasing performance requirements on infrastructure systems combined with the political pressure to save costs, to downsize the organisation and to increase market involvement in infrastructure management have put Rijkswaterstaat in a difficult position, in which it is seeking to redefine its role and position towards market parties. Based on an in depth organisational analysis van den Brink (2009) sees the future of Rijkswaterstaat either in the return to its technocratic role, or in the adoption of a more democratized role, in which it functions as a facilitator, director and broker by bringing together all relevant parties and expertise. Given the development Rijkswaterstaat is currently going through as described above, I take the stand that the democratized role is preferable. The next section will describe the issues that come along with adopting this role.

⁶ In Dutch: markt tenzij.

⁷ In december 2014 the first DBFM contract for a ‘water object’ was granted for the ‘keersluis Limmel’ project (Ministerie van Financiën, 2014). This project is part of a program consisting of 5 DBFM projects (Rijkswaterstaat, 2013).

⁸ A good example of ‘early market involvement’ are the market consultations for the Afsluitdijk and Brouwersdam Projects, in which market parties could freely provide ideas about innovative solutions and scope of the projects, see (Projectbureau Getijdencentrale Brouwersdam, 2014; Rijkswaterstaat, 2012b).

1.4 The potential of market involvement and the need for adequate public-private role division

The involvement of market parties in infrastructure management tasks such as maintenance, to design, construction and plan development is widely believed to be beneficial.⁹ This means that market parties can add value to infrastructure projects which results in higher quality, innovative and creative solutions for a lower price, that are realized within a shorter time frame, which the government not could have provide alone (Li & Akintoye, 2003). The knowledge of market parties can also be used outside the scope of infrastructure projects, namely in the process of exploration and planning. This can lead to more realistic planning, optimize the programming of projects and enhance conceptual creativity (Leendertse et al., 2012). In the case of replacement market early market involvement can lead to less hindrance during the replacement itself (ibid).

The benefits of market involvement above all depend on how the arrangements with market parties are governed. The incentive structure is plays a key role in this (Leendertse, Lenferink, et al., 2012; Schoenmaker, 2011). The added value market parties can provide require 'freedom' and the shifting of responsibilities from government to market parties (Leendertse & Arts, 2013). Only if this freedom is arranged adequately the potential of market involvement can materialize.¹⁰ From this, the need for adequate public-private arrangements for strategic infrastructure replacement can be derived.

1.5 Problem description

The missing link in infrastructure management: the need for an integrated network approach

The replacement challenge that lies ahead is of a different kind than Rijkswaterstaat is used to manage. Especially the strategic nature of large scale replacement creates the need for a pro-active approach of the management of assets in which the impact of external influences are addressed and the interdependencies between assets within a network are acknowledged. This emphasizes the need for in depth knowledge of the 'role' of the object in its surrounding and the current and future state and performance of the object as the starting point for replacement, since it is believed to both increase the quality of the replacement and the cost effectiveness (Lenferink et al., 2013b).¹¹ However, recent research showed that the current management activities of a reactive nature, focused on a short time horizon and were strongly maintenance oriented (Volker et al., 2013; Wijnia & Herder, 2009).¹² Infrastructure assets are only maintained such that they stay in shape or are repaired after damage occurred (ibid). Furthermore, data about the maintenance history and functioning of the assets is not always available, or is stored in different, inconsistent formats (Volker et al., 2013). Market parties are involved to simply execute maintenance on short term basis. Differently stated, asset management is tactical and operational oriented, while replacement requires a strategic orientation. Hence a different management approach is required for replacement.

The struggle of public-private role division

In addition to the emphasis on tactical and operational management activities, the full potential of market involvement is not achieved. Currently, market parties are mainly involved on project basis, which leave little room for market parties to innovate outside of one particular project. In this sense the current public-private arrangements hamper innovation (Buiten & Hartmann, 2014). Also the relation between public and private parties hampers innovation. In practice, both public and private parties pursue their own interests, instead of trying to achieve a common goal (Algemene Rekenkamer, 2014; Ministerie van Financiën, 2014; Stuiveling, 2013), which is required to realize the full potential of market involvement. Higher costs and lower quality products are the consequence (ibid). Besides, many infrastructure management tasks, such as design, construction, operation and maintenance have been

⁹ Involvement of market parties here covers all potential 'forms' ranging from simple maintenance contracts, to integrated projects such as DBMF(O) to early market involvement initiatives.

¹⁰ What is considered adequately will be discussed in chapter 3 and chapter 5.

¹¹ Quality can be described here as the degree to which the new object satisfies the needs of the stakeholders that have an interest in functioning of the object, such as users (citizens), service providers, local governments etc.

¹² A further specification is appropriate here: The start of the VONK Program (Vervangingsopgave Natte Kunstwerken) and the large scale identification of end of lifetimes and critical assets in the RINK Program (Risicoinventarisatie Natte Kunstwerken) as well as the development of the 'Gevoeligheidstest Natte Kunstwerken' show a shift towards a more strategic approach (Rijkswaterstaat, 2014).

sourced out over a wide variety of market parties (Volker et al., 2012), each having their own responsibilities and tasks, which hampers coordination in infrastructure management (Buiten & Hartmann, 2014). Also valuable information for infrastructure replacement is lost, sometimes even as a result of deliberate actions of the contractor (Algemene Rekenkamer, 2014). Information about the current performance of assets is often not available or not even monitored or monitored in different, incompatible formats (Volker et al., 2013).

Next to this, the governance mechanisms that are used require further attention. Elaborate research on public-private contracts in the Netherlands showed that Rijkswaterstaat experienced difficulties in managing the performance and behaviour of contractors. Strategic behaviour, acting in own interest while harming the interest of other parties, information asymmetry and skyrocketing transaction costs raise doubt about the effectiveness of current forms of market involvement (Altamirano, 2011; Schoenmaker, de Bruijn, & Herder, 2014). Recently, Ballast Nedam experienced serious problems in the A15 project create reasons for concern at large building companies and increased carefulness with participation in large and complex tendering projects (Houtekamer, 2015).

Infrastructure replacement requires ‘new’ forms of market involvement

Concluding, replacing infrastructure assets requires a more strategic approach as opposed to traditional infrastructure management. This means that an integrated approach, that is proactive, goes beyond the object itself and is based on system knowledge and detailed information about the current and future state of the object. Only then cost efficient and high quality replacement can be achieved. Given the newness of replacement and the political pressure on downsizing Rijkswaterstaat’s organizational capacity, market involvement is necessary. Current methods of market involvement and responsibility division are however inadequate, since they hamper innovation, transfer of knowledge, provide inadequate risk allocation. These both harm Rijkswaterstaat as client and the market parties, since they lead to higher costs, harmed relationships and extended duration of projects. However, it is not known how market parties should be involved with regard to infrastructure replacement, since several trade-offs are involved:

Trade-off 1: Balancing between control and freedom: giving freedom to market parties is required to stimulate innovation and development of smart solutions, but will increase the uncertainty of outcomes. Given the importance of well-functioning of infrastructure the need for control is understandable.

Trade-off 2: Balancing between horizontal and vertical relationships (principal vs partner): The infrastructure manager has to play two roles: a hierarchical principal role in contract relationships; at the same time a partner role for creating equality and stimulate innovations and other private initiatives.

Trade-off 3: Balancing between competition and cooperation: Competition among market parties (tendering) is generally considered to lead to lower prices, however lead to a distant client contractor relation thereby often decreasing quality and innovation (Lenferink, Tillema, & Arts, 2014). Cooperation may lead to higher prices, but increasing quality and innovation levels (ibid).

Trade-off 4: Balancing between transaction costs and gains: involving market parties for delivery of infrastructure management tasks may lead to cost efficiency, however also requires interaction and coordination of between client and contractor and thereby partly or completely decrease the added value (Altamirano, 2011; Schoenmaker, 2011).

These trade-offs show the importance of shaping the right relationship between public client and market parties and therefore require further research.

1.6 The need for ‘new’ public-private arrangements: research questions and scope

Both the management of infrastructure assets as the involvement of market parties require a change. Thereby it is important to have both the management methodology and the market involvement aligned (Volker et al., 2013), since the market involvement influences the performance of the assets, and the management methodology influences the ‘type’ and ‘form’ of market involvement. Current infrastructure management principles, such as asset management are however mainly focused at the operational level, that is maintenance of assets (Wijnia & Herder,

2009). Market involvement in its most far reaching form currently applied (DBFM and early market involvement) are project bound and do therefore not fit in with the project exceeding approach replacement requires. Hence there is need to both examine a suitable infrastructure management methodology as the way market parties are involved for strategic infrastructure replacement. The latter concerns the division of responsibilities and tasks, and the ‘shaping’ of the relation between public client and market parties (contractors). From now on this will be indicated by the term public-private arrangements. The following preliminary definition can be formulated (developed by author): an organizational form of cooperation between at least one public and one private party which aims at achieving a common goal.

Given the ‘newness’ of replacement, the contribution of market parties to replacement and the role of public-private arrangements to this extent need to be determined. Hence the objective of this research is twofold. First, to determine the infrastructure management tasks that come along with strategic infrastructure replacement. Second, to determine which public-private arrangements contribute positively to infrastructure replacement. This leads to the following main research question and sub questions:

“To what extent can market parties play a role in the strategic replacement of infrastructure and which public-private arrangements need to be used accordingly?”

1. How does a theoretical framework for examining the role and composition of public-private arrangements for strategic infrastructure replacement look like?
2. How does a framework for describing public-private arrangements according to the theoretical framework look like?
3. Which tasks and roles involved in replacement can be identified based on the research framework?
4. Which task and role division are applicable to infrastructure replacement in the Netherlands and which public-private arrangements can be composed accordingly?
5. Which of task- and role division and arrangement(s) can be applied to a case concerning strategic infrastructure replacement in the Netherlands?
6. To what extent are the results of this case generalizable?
7. What can be concluded and recommended from these results for the role of market parties in strategic infrastructure replacement and the arrangements used to this extent?

The following deliverables will be aimed for in this research. First, a framework that covers the relevant infrastructure management tasks that need to be executed for infrastructure replacement, the so called *infrastructure management framework*. Second, a framework that will describe public-private arrangements: *arrangement framework*. Third, detailed public-private arrangement(s) that are potentially beneficial for infrastructure replacement.¹³ Fourth, an advice on how to further develop these arrangements, including first thoughts on implementation. This study has to be regarded as a first explorative research into public private arrangements for strategic infrastructure replacement.

This research focusses on the replacement waterway construction works assets (in the Netherlands). Those are (among others) sluices and locks. These assets do not stand on their own, but need to be considered as part of a larger network, hence a network perspective will be used, whereby a network can be defined as a geographically and functionally demarcated set of infrastructure assets that both influence and are influence by the network performance (Leendertse, 2015; Roovers & van Buuren, 2014). Furthermore, the perspective of an infrastructure manager will be taken. This means that political decisions are explicitly outside of the demarcation, but the effects will be taken into account. Figure 2 visualises the network perspective and focus of this research.

¹³ Given the limited time available for this research (6 months), public-private arrangements cannot be tested and implemented. Therefore the arrangements that are expected beneficial will be aimed for.

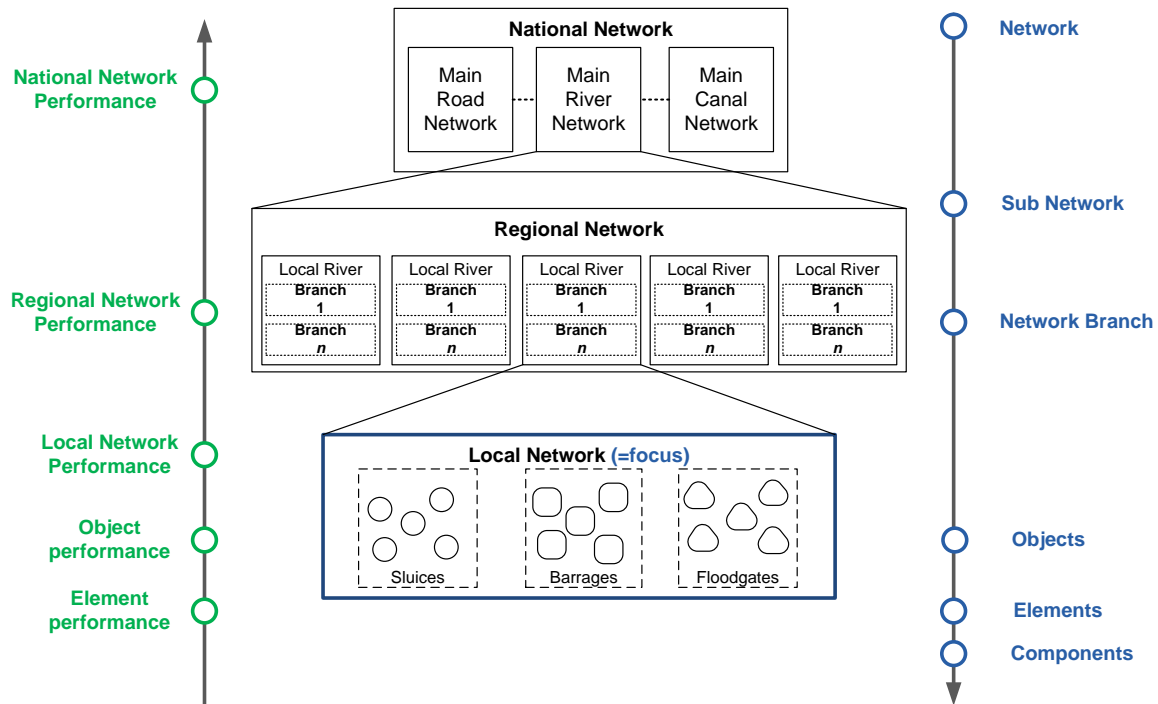


Figure 2 Infrastructure network decomposition (based on van der Velde et al., 2013)

1.7 Societal and scientific relevance

This research aims to contribute to the ongoing discussion of role division between public and private responsibilities in the field of infrastructure management. Thereby it contributes both to the literature of public-private partnerships and public-private cooperation, as well as the asset management literature. Given the relevance of infrastructure replacement in western countries, this research also aims to create valuable scientific insights in how to arrange the governance structure of an infrastructure replacement process. There is much to gain in the field of public-private partnerships, given that the effects are not undisputed. More fine-tuned public-private arrangements for infrastructure replacement may not only increase the quality of the replacement process, but may also lead to cost reductions and thereby directly contributes to society: more efficient allocation of public capital (tax money).

1.8 Reading guide

The search for public-private arrangements starts firstly with the definition and conceptualization of arrangements in chapter 2, which will be combined with the development of the research framework. The arrangements are operationalized in chapter 3. The story goes on with the identification of infrastructure management tasks for replacement in chapter 4. Chapter 5 integrates the infrastructure management tasks and the arrangement framework in order to determine suitable task allocation and arrangements for replacement. These will be further investigated in a case study in chapter 6, of which the results are evaluated and will be validated in chapter 7. The story ends with conclusions and recommendations in chapter 8 and a discussion and reflection in chapter 9.

2. Research Design and Methodology

Since the research questions are clear now, it is time to formulate a research design for answering the research questions. Composing public-private arrangements (PPAs) first of all requires an understanding of the concept of PPAs. Therefore this chapter starts with a section on the definition of PPAs. The second section presents the concept of PPAs, including the context in which arrangements are settled. Next, the theoretical framework will be presented in section 3 and is followed by the research approach (section 4) and research methodology (section 5).

2.1 A definition of public-private arrangements

In order to investigate public-private arrangements operationalization is required. The term public-private arrangement is nearly defined in infrastructure literature, but used by several authors (see Savas, 2005; Edelenbos & Teisman, 2008; Zheng, Roehrich, & Lewis, 2008). The wide spread use and the abundance of a clear definition on (public-private) arrangements and create a need for clarity on the one hand, but also indicate that the term and concept arrangement cannot be uniformly defined and described. Hence it will be difficult to clearly demarcate the boundaries of an arrangement: when can we speak of an arrangement? The remaining part of this chapter therefore has to be interpreted as a possible description of the arrangement concept. The following definition of a public-private arrangement functions as a starting point for this research (definition developed by researcher):

A public-private arrangement describes the relation between at least one public and one private party, that jointly aim to achieve a common goal, be it in a formal or informal manner, that is with or without an agreement, though at least with the intention to share resources.

The main reason for governments to involve private parties via PPAs is to receive more “value for money” (c.f. Jefferies, 2006; Ng & Loosemore, 2007; Siemiatycki & Farooqi, 2012). This means that by means of the public-private arrangement both parties are able to allocate their resources in a new, innovative manner (Dunn-Cavelty & Suter, 2009), such that this combination leads to (Leruth, 2012; Schaeffer & Loveridge, 2002; Steijn, Klijn, & Edelenbos, 2011):

1. **Increased efficiency:** the same product for fewer resources spend.
2. **Increased effectiveness (added value):** create a product of higher value than was possible when doing the same task alone (synergy).
3. **Innovation:** create a new product by means of new capabilities.

To this extent public-private arrangements can be seen as forms of cooperation, since they enable both the public and private parties to reach their objectives that could not have been reached without the cooperation (Dunn-Cavelty & Suter, 2009). Cooperation is initiated in case all parties expect to benefit from it and need the cooperation to achieve their goals and pursue their interests. The aim for and result of collaboration will vary per arrangement and can entail both physical and non-physical products (Schaeffer & Loveridge, 2002).¹⁴ Figure 3 shows the concept of cooperation. In order to conclude the prerequisites for cooperation are given below:

1. The actors should have complementary goals stem from ‘common ground interests’.
2. These goals can only be achieved by means of cooperation.
3. The actors participating in the cooperation should therefore be interdependent before the cooperation starts (Dunn-Cavelty & Suter, 2009).

¹⁴ An example of a physical product is the realization of an innovative sluice. A non-physical product is stimulating transfer of knowledge between government and market parties.

Given the increased interdependencies of public and private parties and their mutual dependencies for goal achievement in general, but especially in the field of infrastructure development (Teisman & Klijn, 2002) there will be no doubt these requirements apply to strategic infrastructure replacement. Therefore we can limit the search for suitable public-private arrangements to forms of cooperation.¹⁵

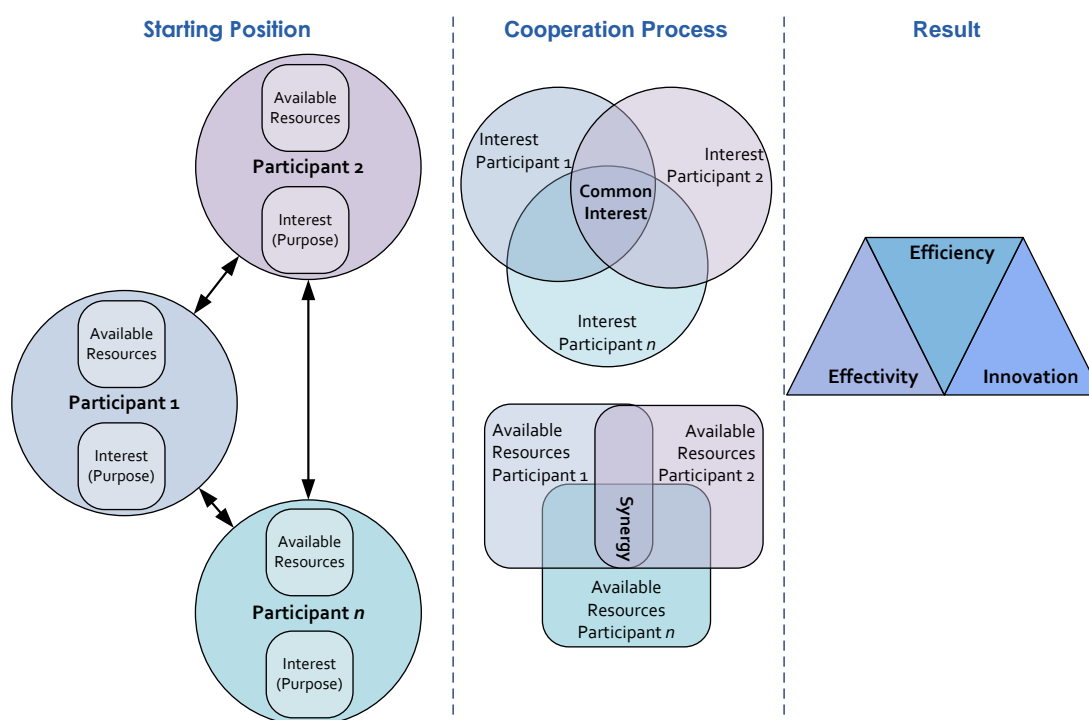


Figure 3 Overview of the cooperation concept (developed by researcher, based on Schaeffer and Loveridge, 2002; Dunn – Cavely & Suter, 2009)

2.2 The concept of public-private arrangements

Arrangements shape the relation between the participants, but what determines the initiating and design of the arrangement? It is important to clearly distinguish between the elements that form an arrangement and the results of these elements in order to set the boundaries of this research.

According to Koch & Buser (2006) the relation between public and private parties is shaped by both governance and meta-governance mechanisms. The governance mechanisms shape the relation between the public client and the private contractors, which in essence resembles the embodiment of the arrangement (more on this in chapter 3). The meta-governance mechanisms are the mechanisms and processes 'outside' the client-contractor relation, such as incentives, laws, guidelines and complete contracts. As such, laws and regulations, but also 'culture' and habits will influence the design of the arrangements. Since cooperation exists because of the mutual dependency of the parties cooperating, it can be derived that the degree of mutual dependency is determining for the arrangement. These mutual dependencies will be a result from the resources each parties has available and the relevancy of these resources for the cooperation purpose at hand. Therefore I call this factor the relative resource position of parties.

The agreements on the input and allocation of resources and the subsequent financial return agreed upon in the arrangement, determine the incentives the participants experience, which in turn is leading for the behaviour the participants will display (Grimsey & Lewis, 2002; Nisar, 2007). Hence, the risk distribution is a result of how the arrangement is shaped. Each participant will contribute to the arrangement by making their resources available, which I name the *allocation of resources*. Combined with the financial returns expected and the conditions that apply,

¹⁵ For the sake of clarity: cooperation is a specific type of relation between parties. Arrangements in general are thus not restricted to cooperation and can cover a wide variety of relationships (see chapter 3).

this will determine the risk distribution, that is the risk profile for the participants.¹⁶ The degree to which parties contribute to the cooperation will depend on how their interests are aligned during the cooperation and the extent to which the cooperation contributes to the goals of the participants individually. Given the long timespan involved in infrastructure replacement the interest of parties may change, even in such a manner that the cooperation does not serve the interest of one of the participants any more. In that case it is not worthwhile for a party to further allocate resources. Therefore, the behaviour of participants consists of a variable part (commitment) and a constant part (obligations). The external factors that surround and influence public-private arrangements will influence the behaviour of the participants.¹⁷

The outcome of the arrangement is the result that is achieved from the cooperation. Expressed in ‘cooperation terms’ the result can be defined as the degree of common interest that has been achieved. Since the purpose of public-private cooperation is to achieve costs-efficiencies, quality improvements and development and implementation of innovations, these criteria measure the result of the arrangement. The common interest does not necessarily have to be the same as at the beginning of the cooperation. Interests may change over time, due to external factors. The definition of success for a 50 year project may be different at the start of the project than at the end. An overview of the arrangement conceptualisation is provided by figure 4.

The focus of this research will lay on the arrangement itself and the expected outcome of this arrangement setting. The aim of this research is to find potentially beneficial arrangements given the replacement task at hand and to find implementable arrangements. Given the ‘newness’ of replacement the contextual factors will not be taken into account, since it is expected they will highly constrain the arrangement settings. The *initial setting* and *contextual factors* will be considered a given. That is the pre-arrangement selection of participating parties, such as tendering procedures are not taken into consideration.

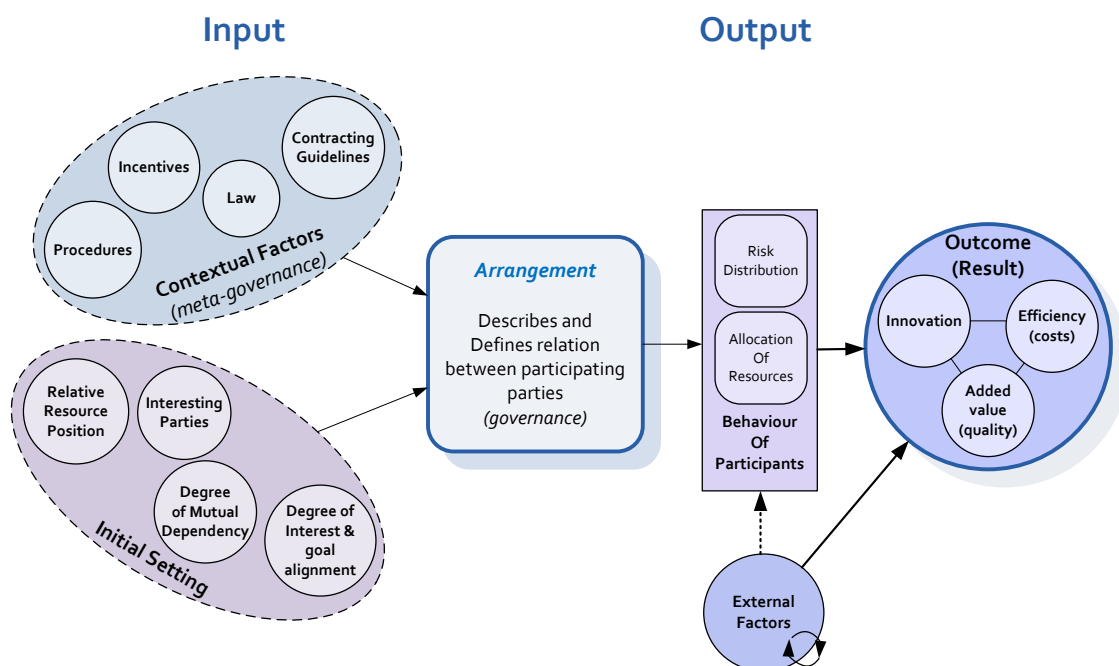


Figure 4 Conceptualization of public-private arrangements (developed by researcher, inspired by Koch & Buser, 2006)

¹⁶ Therefore the risk distribution between public and private parties is not the main focus of this research. For a thesis on public-private risk allocation on infrastructure projects in the Netherlands I refer to Moll (2015).

¹⁷ External factors are to this extent contextual factors that change during the arrangement duration. For example, if one of the projects a contractor executes faces unexpected major losses such that continuity of the company is at stake this will influence the behaviour of the contractor in other projects the contractor executes (i.e. strong risk averse behaviour).

2.3 Developing a theoretical framework

The research framework forms the theoretical basis of this research with the purpose to formulate the input for the design of public-private arrangements (PPAs). Literature research provides an excellent starting point for defining public-private arrangements for infrastructure replacement, since it provides a rich source of both methodologies to manage infrastructure networks (systems) as well as the analysis of public-private cooperation forms that can serve as a basis for design of the arrangement framework. The research framework should be able to create useful and valuable insights for the following:

1. Do justice to the complexities involved in infrastructure replacement (see section 1.2).
2. Identify tasks and responsibilities for long-term replacement of infrastructure.
3. Provide clear guidelines for the efficient bundling and allocation of these tasks and responsibilities.
4. Provide guidelines for efficient allocation of tasks roles and responsibilities between public and private parties.
5. Identify the elements of public-private arrangements as the building blocks PPAs consist of.
6. Provide guidelines and criteria for the choice of PPAs suitable for long-term replacement.

Based on these requirements a theoretical framework consisting of socio-technical systems, asset management, and public-private partnerships and public-private cooperation is chosen. The next paragraph explains the selection and composition of the research framework.

Socio technical systems: a holistic perspective on infrastructure replacement

Waterway construction assets do not stand on their own, but are part of a network, as was indicated in figure 2. Infrastructure systems consist of numerous interdependent subsystems, that mutually influence their behaviour and performance in an hierarchical way: infrastructure systems are complex systems (de Bruijn & Herder, 2009).¹⁸ The several layers the systems consist of are interdependent. In order to structure the view of infrastructure management, a systems approach to infrastructure management can be used (Verlaan & Schoenmaker, 2013). A technical systems approach alone is not sufficient however. An infrastructure system also needs social components, ‘mechanisms’, such as management, control and governance mechanisms (contracts) to make the system function and thereby let it achieve the infrastructure objectives (Herder, Bouwmans, Dijkema, Stikkelman, & Weijnen, 2008; Weijnen & Bouwmans, 2006). The social, actor component and the system as physical network are in that sense intertwined (Bauer & Herder, 2009). When designing public-private arrangements, both components have to be addressed. Thus, in order to design successful public-private arrangements for the replacement of the waterway assets, both the technical characteristics of these assets and their function within the system, as the social components involved and their interactions need to be analysed. This includes the institutional setting. For this purpose asset management will be used to analyse the technical part, whereas public-private cooperation and public-private partnership literature analyse the social (actors) components. The actor component exists of the public and private entities that are interacting with the infrastructure systems in order to reach their own objectives. Figure 5 shows how an infrastructure system looks like from the socio-technical perspective.

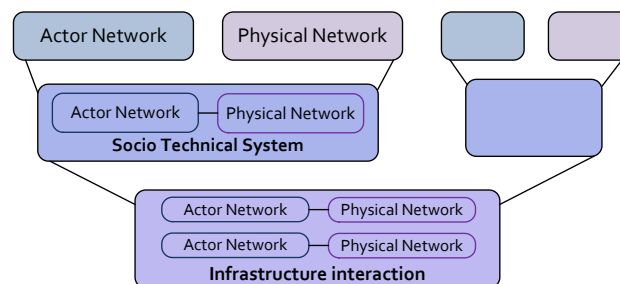


Figure 5 Infrastructure as a socio technical system (adapted from Weijnen & Bouwmans, 2006)

¹⁸ To this regard the term *system of systems* is often used (Bauer & Herder, 2009; de Bruijn & Herder, 2009).

Asset Management: a structured approach to infrastructure management

Replacing water infrastructure assets is in essence an infrastructure management activity. Infrastructure (asset) management “includes the full range of asset planning and creation strategies, operation and maintenance, performance monitoring, accounting and economics and audit and renewal analysis”¹⁹ (Volker et al., 2013:442). Therefore, replacement needs to be considered within the broader context of all management activities. Asset management provides clear guidelines and management principles on how to arrange the process of decision making on whether to replace or not, hence is considered a useful methodology to both analyse replacement tasks and allocate them accordingly.²⁰ This becomes clear from the following four key elements of asset management (Too, 2010, p. 36):

1. **Aligning assets and operations with organizational (corporate) strategic objectives:** alignment of stakeholder, legislative and operational requirements and financial objectives through the whole organization in order to create value for the shareholders and stakeholders involved.
2. **Linking decision-making with asset information:** Aligning organizational objectives with asset performance and vice versa, but also dealing with trade-offs related to financial performance, operational performance and risk exposure in decision making, both of assets individually as collectively. Decisions should be based on the current performance and state of the assets.
3. **Using life-cycle costing:** minimizing the cost of an asset from initial investment to maintenance and replacement.
4. **Adopting a learning process:** the complete organisation needs to be ‘tuned’ to asset management and contribute to the overall, strategic, top level organizational objectives. Asset management is above all a process of learning (Wijnia, Croon, & Liyanage, 2014).

Next to these key elements, asset management is furthermore useful for examining infrastructure replacement for four supplementary reasons. First, “asset management recognizes interactions and interdependencies between subsystems (and assets) and with the environment, and tries to account for them in making plans and taking action” (Verlaan & Schoenmaker, 2013, p. 5) and thereby addresses the complexity involved in infrastructure replacement and links it to decision making concerning intervention measures, such as maintenance and design. Second, asset management explicitly makes the connection between the long-term, mid-term and short term (table 1), hence provides valuable management principles on how to arrange long-term decision making regarding the infrastructure assets, based on the current situation, however with the long-term perspective (lifecycle of the assets) in mind. Third, asset management literature provides clear guidelines on the division of infrastructure management tasks among the parties involved. Fourth, asset management emphasizes a learning approach and the importance of feedback between the decision making levels, which is in line with the dynamics involved in socio technical systems.

Table 1 Definition of strategic, tactical and level of asset management (based on The Institute of Asset Management, 2014; Too & Too, 2010; Zhuang, Lei, Djairam, & Smit, 2011)²¹

Level	Time span*	Focus
Strategic	Long-term (>30 year)	Investment optimization, risk level setting, long-term performance
Tactical	Mid-term (10 - 30 years)	Optimization of cost and risks
Operational	Short term (<10 year)	Optimizing lifecycle activities (design, maintenance etc.)

Note. * For infrastructure the time span is relatively long: plans for 50 years are also possible (no strict separation)

¹⁹ Strictly speaking infrastructure management and infrastructure asset management are not the same, since asset management an approach to infrastructure management (Verlaan & Schoenmaker, 2013). In the (public) infrastructure management literature though, infrastructure asset management is often used as a synonym for infrastructure management (see Demirel, De Ridder, & Hertogh, 2013; Herder & Wijnia, 2012; Volker et al., 2013).

²⁰ The field of asset management is not restricted to application for infrastructure systems (Herder & Wijnia, 2012; The Institute of Asset Management, 2014). In this research asset management entails infrastructure asset management. Appendix 1 provides an overview of asset management definitions.

²¹ A similar distinction can be made as regards the public client – market relation, with the operational level resembling the project level, tactical level resembling the relation between market parties and network managers and the strategic level between network managers and the market as a whole (Leendertse, 2015).

Public-private partnerships and public-private cooperation

Even though public-private arrangements are used for a wide variety of services, in many sectors and come around in many forms (Linder, 1999), the scope of this research consist of the infrastructure services and infrastructure development (replacement) on the strategic level (long-term) aimed at cooperation. Public-private partnerships (PPPs) have been introduced to facilitate public-private cooperation (Linder, 1999; Wettenhall, 2003) and therefore provide valuable input for determining how public-private arrangements should look like. Besides, recent experiences with PPPs have also indicated ample room for improvement, the division of risks, responsibilities and tasks in particular. The field of public-private cooperation (PPC) is more general than PPP, since PPP is often considered to take on a specific form of public-private cooperation (Teisman & Klijn, 2002).²² Involvement of the PPC literature in this research is therefore fundamental to designing arrangements for public-private cooperation. Table 2 provides an overview of how the composed theoretical framework meets the framework criteria.

Table 2 Overview of criteria assignment of the research framework

Criterion	Fulfilled by		
	STS	AM	PPP/C
Do justice to complexities involved in infrastructure replacement, the so called infrastructure characteristics	✓	✓	
Identify tasks and responsibilities for strategic infrastructure replacement		✓	
Provide clear guidelines for the efficient bundling and allocation (roles) of these tasks and responsibilities		✓	✓
Provide guidelines for efficient allocation of tasks roles and responsibilities between public and private parties		✓	✓
Identify and describe the elements of public-private arrangements		✓	✓
Provide guidelines and criteria for the choice of PPAs suitable for strategic infrastructure replacement		✓	✓

Note. STS = Socio Technical Systems; AM = Asset Management; PPP/C = Public-private Partnership / Cooperation

2.4 Research Approach

In order to find rich and substantive answers to the research questions a solid research approach is required. This research consists of five phases: exploration, conceptualisation and specification, preliminary and final design, evaluation, and conclusions and recommendations. The purpose of the exploration phase is to explore both the replacement context in the Netherlands and the general characteristics of infrastructure assets and systems. These have led to the introduction to the formulation of strategic decisions that underpin strategic infrastructure replacement (see section 1.2). These decisions form the 'leitmotif' of this research and are leading for the other phases. The conceptualisation phase provides both the theoretical framework and aims for the creation of two other, independent frameworks, namely the *replacement framework* that consists of the tasks involved in infrastructure replacement and the *arrangement framework* that operationalizes public-private arrangements by describing arrangement elements (building blocks).²³ Next, guidelines for task division and arrangement design will be formulated based on the replacement context in the Netherlands and literature and thereby specify the general frameworks. This specification phase will lead to the preliminary design of alternatives, which consist of a combination of public-private task division and arrangements. These preliminary, still general, designs will be tested in a case study, which results in detailed alternative designs. These designs will be evaluated and generalized. Then, the only thing that remains is the formulation of conclusions and recommendations. Now the research approach is clear it is time to develop the research methodology, which aims at facilitating the completion of the research approach.

²² In many countries PPP has become a specific type of public-private cooperation: DBFM in the Netherlands, PFI in the UK for example. Unfortunately these forms do not resemble public-private cooperation as intended. Involvement of the PPC field is therefore necessary, in order to involve the core principles of public-private cooperation in this research.

²³ Independent means that the frameworks are general (independent from replacement). Hence, the infrastructure management framework can be applied to all infrastructure management situations and the arrangement framework to all forms of public-private interaction in infrastructure projects/programs, ranging from traditional to innovative forms.

2.5 Research Methodology

This section describes the research methodologies that can and will be used to facilitate the research approach. Subsequently the literature review, semi-structured interviews, case study and focus group methods will be explained.

Literature review

In accordance with the theoretical framework, literature review will be conducted in the field of infrastructure (asset) management, public-private partnerships and public-private cooperation. Literature will be gathered by means of the snow ball method, which means that the search for relevant literature proceeds until no relevant literature is found.

Semi-Structured Interviews

Semi-structured interviews can be used to explore a subject, though providing enough structure to give substantive answers (Baarda & de Goede, 2001; Hammer & Wildavsky, 1993; Rose, 1994) and are therefore used for the exploration of the replacement context in the Netherlands. The dialogue used in the semi structured interview will lead to opening up of new topics and are therefore useful for more exploratory and broad research questions (DiCicco-Bloom & Crabtree, 2006; Whiting, 2008). By means of probing the interviewer can assure (s)he receives answers to all questions and ambiguities and vague answers are minimized (Barriball & While, 1994). Appendix 2 shows the interview protocol that is used during the executing of the interviews.

In order to give a balanced view on replacement and public-private arrangements suitable for this, the respondents will both be public and private. Since strategic replacement of waterway construction assets also require the connection with tactical and operational infrastructure management practices, these were also balanced. Also the socio and technical view have been balanced, which is expressed in involving interviewees from both a technical field of expertise (asset management) as the social point of view (public-private partnerships/cooperation). The selection criteria below were used, which resulted in a respondent selection as showed in table 3.²⁴

1. The interviewee should have experience with either public-private partnerships or infrastructure (asset) management in the Netherlands, preferably related to Rijkswaterstaat (national infrastructure manager)
2. The respondent sample should balance the public and private perspective.
3. The respondent sample should balance the strategic, tactical and operational infrastructure management levels.

Table 3 Overview of respondent selection semi structured interviews

Interviewee	Organisation	Public	Private	Independent	'Level'			Area of Expertise	
					S	T	O	PPP/C	AM
J. van der Velde	Rijkswaterstaat	✓			✓			✓	✓
J. Schavemaker	Rijkswaterstaat	✓			✓	✓			✓
L. Klatter	Rijkswaterstaat	✓			✓	✓	✓		✓
P.Ackermans	Antea Group		✓		✓			✓	
E. Deuring	Antea Group		✓			✓	✓		✓
W. Leendertse	Rijkswaterstaat	✓			✓			✓	
R. Schoenmaker	TU Delft			✓		✓	✓		✓
L. Hombergen	TU Delft			✓	✓	✓		✓	
J-L. Hof	Antea Group		✓			✓	✓		✓
P-J. Bus	Rijkswaterstaat	✓			✓			✓	
P. van Dijk	Van Oord		✓		✓			✓	

Note. S = Strategic; T = Tactical; O = Operational; PPS/C = Public Private Partnership / Cooperation; AM = Asset Management

²⁴ Interviews were held in February, March and April 2015. All interviews were recorded, transcribed and summarized. All participants did at least approve either the transcript or the summary. Transcripts and summaries can be requested by the researcher by sending an e-mail to the author.

Case Study

The suitability and effects of public-private arrangements is highly dependent on the (institutional) context in which the arrangement is placed (Koppenjan, 2005). Hence an in depth analysis is required in order to explore the context in which the arrangement is examined. Given the context dependency the case study method is a suitable research method, since it “*investigates a contemporary phenomenon in depth and within its real-life context*” (Yin, 2009, p. 18). Given the importance of the context for public-private arrangements the case study should be executed thoroughly and therefore requires a significant time budget. For this reason, a single case study is chosen.

The use of a single case may lead to generalizability problems (Yin, 2009) and the external validity of the study is in danger (Verschuren & Doorewaard, 2010). However, the use of data triangulation can help to limit this effect (Verschuren & Doorewaard, 2010). If a case study is used for theory testing, two cases are considered to be sufficient (Yin, 2009), in this sense the single case study does not fulfil the requirement to test the theoretical public-private arrangement framework. For this reason it is chosen to evaluate the findings of the case study afterwards by means of a focus group in order to determine whether the findings of the case study can be applied to the other largescale replacement projects in the Netherlands. In order to determine whether the arrangements designed are suitable for strategic infrastructure replacement the case should resemble the characteristics of strategic infrastructure replacement as defined in the introduction:

1. The replacement moment is anticipated and covers a long time frame (>20 years).
2. Uncertainty plays an important role, both with regard to the replacement moment as regards what to put in place.
3. The size of the replacement is large, both financially and technically (covers multiple assets).

The case *Stuwen Maas* fulfils all these criteria and is therefore selected. The case is about 7 barrages located in the Meuse River, that have been built in the twenties and thirties of the twentieth century and reach their technical lifetime between 2030 and 2035 (van Tilburg, 2015). The total replacement value is estimated at €500 million. Research into the ‘design’ of *Stuwen Maas* has started in 2008 and is still ongoing. Hence this is widely known, reports have been written, and so data collection will be relatively easy. This makes this case very suitable for using in this research.

The concept of data triangulation advocates to use multiple data sources in order to minimize the effect of chance and create an objective, rich and in depth view of the context and is especially important for single case studies (Verschuren & Doorewaard, 2010). For this purpose data is gathered both from interviews and documents. In order to create a balanced view, both respondents from public and private organizations were selected. The respondents have in depth knowledge of the case, and are therefore suitable to reflect on the public-private arrangements designed. Table 4 provides an overview of the respondents.²⁵ Appendix 3 provides the interview protocol that was used.

Table 4 Overview of respondent selection case study interviews

Interviewee	Organisation	Public	Private	Independent	'Level'			Area of Expertise	
					S	T	O	PPS/C	AM
H. Michon	Rijkswaterstaat	✓				✓	✓	✓	✓
W. van Hengel	Rijkswaterstaat	✓			✓	✓			✓
M. Albrecht	Rijkswaterstaat	✓			✓	✓			✓
S. van Vuren	HKV		✓		✓	✓	✓	✓	✓
G. De Jong	Heijmans		✓			✓	✓	✓	✓
E. Waltje	Antea Group		✓		✓				✓

Note. S = Strategic; T = Tactical; O = Operational; PPS/C = Public Private Partnership / Cooperation; AM = Asset Management

²⁵ Interviews were held May and June 2015. All interviews were recorded, transcribed and summarized. All participants did at least approve either the transcript or the summary. Transcripts and summaries can be requested by the researcher by sending an e-mail to the author.

Focus groups

Since focus groups are considered to be an effective method for evaluation design artefacts (Tremblay et al.,2010), this setting is chosen for the evaluation session. During this evaluation session the public-private arrangement(s) that was/were deemed the most suitable for the case study is examined for its suitability for the Netherlands in general. This is done by firstly explaining the concept of public-private arrangements and the public-private framework. Second, the results of the case study will be explained. Third, these results will be discussed interactively and in an explorative way: what are the advantages of this public-private arrangement and its limitations? They will also be evaluated on their expected performance on the criteria innovation, costs and network quality.

Also for this evaluation session it is important that both public and private views on the public-private arrangements are balanced. Due to the limited time budget available for this research it was hard to find a common moment to have both public and private participants present. Therefore it was chosen to only choose private participants. Appendix 4 provides an elaborate overview of the preparation of this setting, including all documentation and data collection methods being used. Table 5 provides information about the participants.

Table 5 Overview of participant selection evaluation session (focus group)

Interviewee	Organisation	Public	Private	Independent	'Level'			Area of Expertise	
					S	T	O	PPS/C	AM
M.Berk	Antea Group		✓		✓	✓	✓	✓	
B. Keizer	Antea Group		✓			✓			✓
D. Peeters	Antea Group		✓			✓			✓
G. Roovers	Antea Group		✓		✓	✓	✓	✓	✓
J. Vergouwen*	Antea Group		✓		✓	✓	✓	✓	✓
J-L. Hof*	Antea Group		✓			✓			

Note.S = Strategic; T = Tactical; O = Operational; PPS/C = Public Private Partnership / Cooperation; AM = Asset Management;

*Did not participate in the evaluation session, however provided input afterwards.

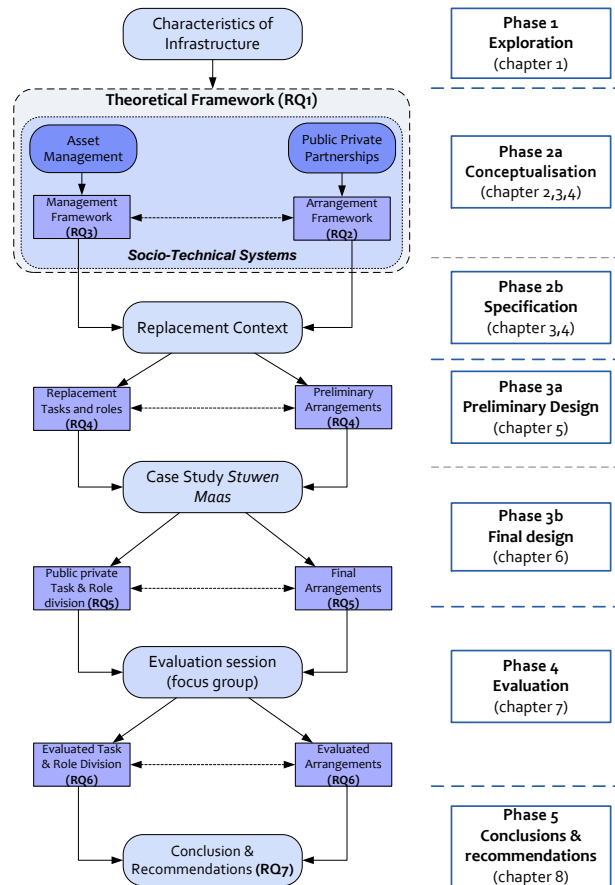


Figure 6 Detailed research framework (developed by researcher)

3. Arrangement operationalization: towards arrangements for strategic infrastructure replacement

Before public-private arrangements can be formulated, first of all further operationalization is required. This will be done by means of the definition of arrangement elements, the so called building blocks of which arrangements consists (see figure 7 and section 3.1). The second section provides guidelines for establishing fruitful cooperation by means of public – private arrangements. This continues with a section on the potential role of market parties for infrastructure replacement in the Netherlands. The fifth section provides the conclusions of this chapter.

3.1 Governance mechanisms as the basis for operationalizing public-private arrangements

Public-private Arrangements are in essence public-private interactions. Public-private interactions are shaped by governance mechanisms (Lenferink, Tillema, & Arts, 2013a). Hence governance mechanisms and strategies can be used for describing public-private arrangements. The following definition of governance will be used: “*coordination, steering and control mechanisms encompassing both structural and procedural elements*” (Koch & Buser, 2006, p. 551). This definition clearly shows that governance is used to ensure the achievement of a certain goal. This is line with the definition of public-private arrangements from section 2.1. The arrangement hence need to have coordination mechanisms to ensure this common goal is achieved, control mechanisms to ensure the cooperation is ‘on track’, steering mechanisms to steer the behaviour of participants in the right direction and structures and procedures that embed these elements. When we apply these ‘guidelines’ to public-private arrangements, the arrangements should at least describe the following elements:

1. Interaction and coordination mechanisms between participants, at least clients and contractors (*coordination, control*).
2. Agreements made between arrangement parties (*control, steering*).
3. Authority and responsibility division with regard to scope, resource allocation decisions, cooperation duration and purpose to be achieved (*control*).
4. Incentives, such as reward distribution, resource allocation distribution and results to be achieved (*steering*).
5. Facilitating measures to make adjustments (interventions) with regard to scope, goal and duration (*control, steering*).

Next to these elements also descriptive elements will be part of the arrangement description, such as the number of parties participating in the arrangement. Hence, the following main elements will form a public-private arrangement:²⁶

1. **Participating parties:** the number of arrangement participants and the numerical ratio public – private participants.
2. **Relationship inter parties:** the authority relation(s) between the arrangement parties and the degree of coordination and interaction between them.
3. **Degree of formality:** indicates how formal the agreement is, including allocation of resources.
4. **Degree of flexibility and ownership:** the degree of flexibility of the initial formulated scope, result and agreement duration.
5. **Responsibility division:** reward and resource allocation distribution and decision making responsibility between the arrangements participant.

²⁶ This is not to say that this is the only possible way of operationalization of arrangements. For example, the risk distribution and allocation can be considered to be part of the arrangement. The elements as presented in section 3.2 have been validated and approved by expert judgement on May 18, 2015 by J. de Schipper (senior legal counsellor, Antea Group).

Next, the elements and sub elements will be described. These elements form the building blocks of arrangement, whereby an arrangement consist of all elements (see figure 7). The arrangement can thus be seen as the complete package of elements. In order to speak of a public-private arrangement, all elements need to be present.

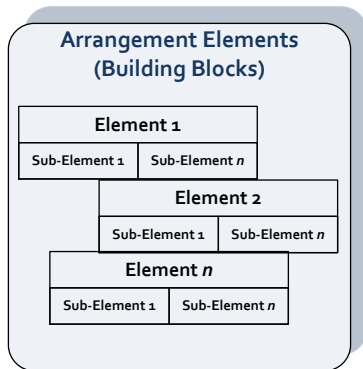


Figure 7 The building block concept as operationalization of arrangements (developed by researcher)

3.2 Elements Definition

This section describes the operationalization of the arrangement elements. This is done by division into sub elements. Each sub-element can have a certain value and is defined by a spectrum of values. A complete arrangement will have a value at each sub element spectrum.²⁷

Element 1: Participating Parties

The number of participating parties and their 'nature' (i.e. public or private) indicate the setting of the arrangements, hence is important for the formulation of public-private arrangements.

Sub element 1.1 Number of participating parties

Cooperation per definition has to exist between two or more parties. The maximum number of participants an arrangement consist of is difficult to indicate, and will among others depend on the complexity of the purpose of the arrangement and the number of interested parties (see Klijn, Edelenbos, Kort, & van Twist, 2008). It is the author's opinion that in order to speak of cooperation in the sense of mutual 'balancing' of goals and interests, the maximum number of participating parties is rather limited, approximately 20.

Sub element 1.2 Ratio public-private participation

The numerical ratio between public and private parties participating in an arrangement can range widely. Public parties can be dominant attendant in case of a project where several public parties from several administrative 'layers' cooperate with one private party (contractor). The ratio can also be equal in case of a traditional principal-agent relation. Private attendance can be dominant in case of a market consultation or competitive dialogue for example (Leendertse et al., 2012; Lenferink et al., 2014).

Element 2: Relationships 'inter partes'

Perhaps the relationship between the arrangement participants is the most discussed element in infrastructure management related literature. Of special importance is the relationship between the public and private parties, given the difference in strategic orientation and interests and institutional setting (i.e. legal responsibilities, rights and power) (Van Ham & Koppenjan, 2001; Klijn & Teisman, 2002; Schaeffer & Loveridge, 2002).

Sub element 2.1 Relative power position public party-private parties

Power relates to the influence a party has to determine the purpose of the arrangement and the division of roles, tasks and responsibilities (Rufin & Rivera-Santos, 2012). Governance relations are often used to describe the relationship

²⁷ To this extent, the arrangement can be considered to be a morphological chart (see Dym & Little, 2009).

between public and private parties.²⁸ Hierarchy can be defined as “*an alliance of parties aimed at a clearly defined common goal with explicitly formulated formal structures and roles.*” (Leendertse & Arts, 2013, p. 194). In this case the public party is dominant, and has all ‘power and information available to make effective decisions himself’ (de Bruijn & ten Heuvelhof, 2008, p. 8). A network, as being the other side of the spectrum, is characterised by equal relationships and power division between all parties involved, that are jointly dependent upon each other in the pursuit for achievement of their goals (de Bruijn & ten Heuvelhof, 2008). An alliance is a good example of an arrangement consisting of equal relationships, even if it is a little network with only a few players involved. The values this element can have are therefore hierarchical on the one hand, which means that the public client has the power to determine the goals unilaterally, and equality on the other hand. A value in between is ‘semi hierarchy’, where the roles are informally shaped, but where the relation is hierarchical to some extent (evaluation of contractor(s)) and equal to the other extent when it concerns interaction.

Sub element 2.2 Type and degree of coordination and interaction

“*Coordination can range from informal efforts to formal agreements, even to the merger of efforts*” (Schaeffer & Loveridge, 2002:175). Coordination exists of the alignment of activities towards the common goal, such that the joint efforts are made more effectively (Leendertse & Arts, 2013). The most ‘intensive’ form of cooperation entails all participants to jointly plan, coordinate and evaluate their efforts, and allocation of their resources in order to achieve the common goal (Leendertse & Arts, 2013). The same goes for interaction, which can be organized ad hoc or is formalized in a so called ‘organizational arrangement’ (Steijn et al., 2011). In formalized form the interaction can take place in special formed groups consisting of top representatives with regularly meetings for example, which aim at stimulation and promotion of cooperation (ibid). Interaction and coordination can be frequently or infrequently arranged. Frequently means at least two times a year and at regular moments, whereas infrequent coordination and interaction is less than two times a year and at irregular intervals.

Sub element 2.3 Degree of organizational fusion

Parties can stay strictly independent, or can ‘merge’. In a joint venture parties cooperate intensively, but remain intentionally independent (Becker & Patterson, 2005), whereas in an alliance like type of cooperation the barriers between organizations are removed as far as possible in order to optimize the collaborative efforts and results (Love, Mistry, & Davis, 2010); Rufin & Rivera-Santos, 2012). Based on this, three values for this element can be defined: fully independent where the participants stay organizationally independent and decide themselves on the allocation of their resources and their contribution to the arrangement; independent (shared resources), where the participants jointly allocate their resources, place it in a different entity and jointly decide on the allocation; fully merged, where all the organizational resources of the participants are allocated and all participants are allocated equal decision making power with regard to the allocation of the joint resources.

Element 3: Degree of formality

Do the participating parties need to have an agreement in order to speak of an arrangement? There is no right answer to this question. It is argued that an agreement is not necessary, however can have advantages. Formality relates to the degree to which an (in)formal agreement is used and whether this agreement is complemented with (in)formal resource allocation agreements or not.

Sub element 3.1 Type of agreement: formal or informal agreement

Within agreements types, two ‘extremes’ can be observed: very formal (strict, rigid) in the form of transactional contracts or informal, less strict agreements based on relational contracting. The ‘contract’ arranges the following elements of the arrangement: responsibility, duty and right division between the participants and the goal of the arrangement (Zheng et al., 2008). With regard to formal contracts these elements are codified strictly, while in relational contracts these are more flexibly arranged (ibid). Table 6 provides an overview. In practice arrangements will be a combination of both informal and formal agreements (Rufin & Rivera-Santos, 2012). Based on this, four

²⁸ Governance relations are also indicated as governance mechanisms. In general three governance mechanism ‘types’ can be distinguished: hierarchy, market and network (Lenferink, 2013). For a detailed overview of governance relations and mechanisms, see Zheng et al. (2008); Leendertse & Arts (2013); Lenferink (2013); Leendertse (2015).

element values can be defined: *no agreement*, *fully informal agreement*, with the division of responsibility, the rights and duties and purpose is broadly defined; *partly informal agreement*, which remain unchanged during the arrangement duration and; *fully formal agreement*, which indicates a static predefined agreement.²⁹

Table 6 Comparison of transactional and relational agreements based on (Wettenhall, 2003; Zheng et al., 2008; Ling et al., 2013)

Agreement Element	Transactional (formal)	Relational (informal)
Type of relationship	Hierarchical (vertical)	Equal (horizontal)
Characteristic	Static	Dynamic
Core components	Control, strict division of tasks and responsibility	Trust, information exchange, cooperation, flexibility
Aim	Lowest transaction costs	Highest quality outcome

Sub element 3.2: Degree of formal resources allocation agreement

This sub-element refers to the formal agreements that are made with regard to the allocation of resources. Earlier in this chapter the importance of the allocation of common resources for the achievement of the common interest as rationale for cooperation was stressed. Also here the agreements can vary between informal agreements that are based on mutual trust and resource allocation based on ad hoc resource needs during the agreement duration, and on the other hand formal agreements, which imply a static and very strict agreement completely fixed from the start on (Schaeffer & Loveridge, 2002). An in between form is a partly formalized agreement, which sets boundaries within which the resource allocation may vary during the arrangement duration.

Element 4: ‘Degree of flexibility and ownership

Flexibility and ownership are essentially different aspects of an arrangement. Ownership points at the extent to which the arrangement duration, purpose and scope are fixed at the beginning of the arrangement or not, while flexibility relates to the complete lifetime of the arrangement (Schaeffer & Loveridge, 2002).

Sub element 4.1: Duration: closed or open? If closed: short, medium, long?

Agreements can have a certain duration that has been agreed upon at the beginning of the agreement, but can also be open: there is no duration limited. In case of a closed duration one can distinguish between short (<5 year), medium (5 – 30 years) or long (>30 years). Also options for duration extension can be built in.

Sub element 4.2: Purpose (result): specific, or general (broad), limited or open ended

This sub-element consists of two ‘spectrum lines’. The purpose of an arrangement is limited if the arrangement is set up to achieve this purpose. Joint Ventures and projects are an example of this (Schaeffer & Loveridge, 2002). In case of a limited purpose, the purpose can be specific, that is at the beginning the outcome (result) of the agreement is known, or the scope is general (broad) and leaves some room for further specification. Partnerships are a good example of this, since one essential element of a partnership is to formulate a common goal or objective (Schaeffer & Loveridge, 2002). This element can hence take on the following values: Limited specific, limited broad and open-ended.

Sub element 4.3: Scope: Open-ended or formally closed

The scope of a project at the beginning of the agreement can be completely open-ended or completely, formally defined. The scope concerns simply all activities that are executed within the arrangement (Rufin & Rivera-Santos, 2012), in this study activities concern asset management activities as indicated in chapter 4. Table 7 shows the differences between an open ended and formally closed scope. An in between value is a half-defined scope that sets the ‘boundaries’, which are to be further specified over time.

Sub element 4.4 Flexibility of arrangement

The flexibility of an arrangement relates to the degree to which agreements that have been made (often with regard to scope, duration and reward distribution), can change during the arrangement duration (Aalstein, 2013). In case the

²⁹ For example, formal procedures regarding the operational management of a barrage in case of high water levels.

arrangement is flexible, the scope, duration and reward distribution can change. Non-flexible arrangements are characterized by a completely static scope, duration and reward distribution at the beginning of the arrangement. Several ‘in between’ options are possible, such as for example a flexible duration and reward distribution combined with a fixed scope.

Table 7 Overview well and ill-defined scope (based on Edelenbos & Teisman, 2008)

	Open-ended	Formally closed
Character	Dynamic	Static
Mechanism	Cooperation	Control
Boundaries / responsibilities	Unclear and changing	Strict and clear
Management principle	Process management	Project management

Element 5: Responsibility division

The last element concerns the division of responsibilities between the arrangement participants, in particular the division of resource allocation division and division of decision making power with regard to the intervention decisions to be taken during all phases of the replacement process (see chapter 4).

Sub element 5.1: Reward distribution (public – private)

Rewards can be allocated individually or shared, and can be limited or unlimited. Individually means that the allocation of rewards is defined for each agreement participant separately, in accordance with the investment, independent from the actual result of the arrangement (Schaeffer & Loveridge, 2002). Shared means that the rewards for all partners are dependent on the result of the arrangement. An unlimited reward means that all parties share equally. A limited reward means that up front the ‘reward’ share is determined. The following quadrant can thus be constructed (table 8).

Table 8 Types of rewards based on Schaeffer & Loveridge (2002)

	Individual rewards	Shared Reward
Unlimited Reward	Reward <i>independent</i> from result, equally shared	Reward dependent from result, equally shared
Limited Reward	Reward <i>independent</i> from result, <i>unequally</i> shared	Reward dependent from result, <i>unequally</i> shared

Sub element 5.2: Resource allocation distribution (public – private)

The funding for project being undertaken, i.e. the distribution of the allocation of resources, can be mainly stem from public resources, private resources or somewhere in between.

Sub element 5.3: Decision making distribution

The decisions under consideration here relate to infrastructure management intervention decisions, such as decisions regarding maintenance, replacement, design and construction of infrastructure assets. To what extent to are the decisions of the participants aligned such that they strive to achieve the common interest? The decision making distribution has two dimensions. The first states that decisions can be fully coordinated or not (Schaeffer & Loveridge, 2002). The difference between these is that in case of coordination the decisions are made with the aim to optimize the joint interest of all agreement partners (consensus for example), in its ideal form even leading to joint decision making (ibid). An ‘in between form’ is that decisions are negotiated and are competitive: next to the common interest, participants try also to maximize their own interest. The second dimension has two values: egalitarian (equal authority distribution) or hierarchical (skewed authority distribution) (ibid). When combining these dimensions the following values appear: egalitarian, negotiated; egalitarian, coordinated; hierarchical, coordinated; hierarchical, negotiated.

Figure 8 shows an overview of all elements, sub-elements and their spectrum values. Now the operationalization of the arrangements has been discussed and defined, it is time to examine the design of the arrangements by examining the values that are considered to be suitable to replacement, the so-called specification of arrangements. The first

specification step can be taken by simply identifying the relations between element values (see Appendix 5). Two other ‘specification steps’ will be taken: the first one by identifying element values required for cooperation, the second by the requirements that stem from the replacement context in the Netherlands.

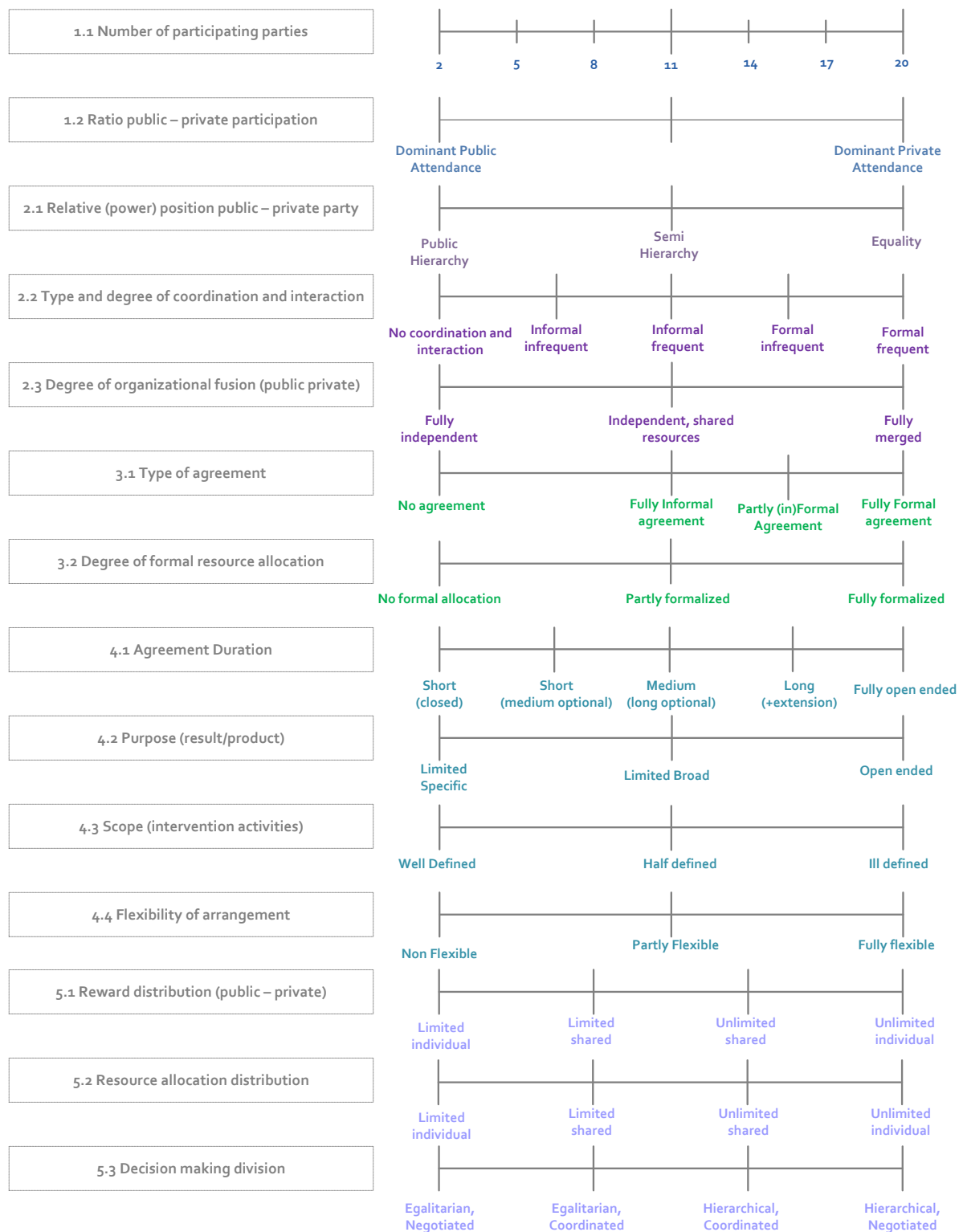


Figure 8 Overview of Public – Private Arrangement framework (developed by researcher)

3.3 Identification of arrangement values that stimulate cooperation

The purpose of this section is to shape the arrangements towards cooperation. This means that the element values which are expected to contribute to cooperation are identified based on public-private cooperation literature.

Essential conditions for the initiation of cooperation

Since public-private cooperation exists as a result of the pursuit of joint goals, the most fundamental requirement of public-private cooperation is that the cooperation is necessary to contribute to these goals.³⁰ In other terms, before the cooperation officially takes place the ‘interdependence of actors and their goals’ (Dunn-Cavelty & Suter, 2009) should be undisputed. All (potential) participants should be fully convinced to benefit from the cooperation. The rewards the participants expect should be ‘positively correlated’ (Schaeffer & Loveridge, 2002, p. 170).³¹ Potential cooperation partners should be mutually aware of their skills and how the partners can contribute to their own goals. The difficult point here is that potential cooperation parties are not always willing to share their interests and goals. First, the ‘degree of trust’ has to develop to a certain level before the exchange of this crucial but ‘sensitive’ information comes into existence. A high level of mutual trust is considered to be the core element (requirement) for fruitful cooperation (Adetola, Goulding, & Liyanage, 2011; Love et al., 2010). However, to create such a level of trust parties need to know each other better and need to have exchanged part of this information; a classic example of a chicken-egg problem (Dunn-Cavelty & Suter, 2009).

Essential requirements for public-private cooperation

The first crucial requirement of the degree of success of the cooperation is that the participating parties adhere to agreed-upon rules and norms (Schaeffer & Loveridge, 2002). This implies that “cooperation needs to be managed” (ibid). The second crucial element is that participants need to have an incentive to cooperate. The more positive the correlation between the expected rewards of the participants, the higher the incentive for cooperation (Schaeffer & Loveridge, 2002). The third requirement is that resources need to be shared, and information need to be regularly and actively exchanged (Love et al., 2010; Leendertse & Arts, 2013). A fourth requirement relates to the distribution of risks³² (Dunn-Cavelty & Suter, 2009). The main area of concern for public-private arrangements is that the risks between the public and private party are allocated efficiently. That does not only mean that the risks should be laid down by the party that has the knowledge, expertise and means to handle them, but also that the reward (risk premium) is sufficient (Jefferies, 2006; Ng & Loosemore, 2007). Sufficient here means that there exists “*a strong positive relationship between risk and reward for the private partner*” (Becker & Patterson, 2005:125). A second aspect is that there should be a “*positive relationship between risk and the degree of involvement of the private partner in development, operations and ownership*” (ibid). Fifth, responsibilities should be communicated clearly between all participants involved (Dunn-Cavelty & Suter, 2009). Sixth, goals and ‘strategies’ of all parties should be unambiguous and clear to all participants before the start of cooperation, and during the cooperation itself of course (ibid).

Stimulating cooperation: early market involvement

One way of ensuring that (potential) participants get to know each other, and each other interests and goals better is by means of early interaction (Zheng et al., 2008), also known as early (market) involvement, early private involvement (Koppenjan, 2005; Leendertse et al., 2012) or early contractor involvement (van Valkenburg et al., 2008).³³ This early interaction allows joint image building between client and contractor(s), such that they get to know each other’s expectations before the actual cooperation starts and hence create a trust relationship (Koppenjan, 2005). Early market involvement is very useful for complex projects, since the risks and complexities cannot be managed and regulated by transactional types of agreements (contracts) (Lenferink et al., 2013a). Hence, early

³⁰ Public-private Partnerships also exist because of the need of public-private cooperation. Unfortunately PPPs have lost most of their cooperative added value over time (see Klijn & Twist, 2006; Savas, 2005; Wertenhall, 2003). In order to have similar goals, the interests of the parties do not necessarily have to be similar.

³¹ Positive correlation here means that the expected rewards of all participants can be achieved by means of the cooperation. That is, they are not mutually exclusive. The interests of the participants are aligned.

³² Willems & Busscher (2015) take a different view on the risk division in a cooperative setting. They state that this is unnecessary and both parties should fully commit to jointly managing the risks.

³³ The term early involvement will be used in the remaining part of this report.

involvement is very useful for the strategic replacement of infrastructure. A point of concern related to the early involvement is the power balance between public and private parties (Zheng et al., 2008). Trust relationships require equal or near equal power relationships, while the public-private ‘relationship’ is often characterised by power inequalities. This is not to say that trust relationships are impossible to exist between public and private parties, but the public party needs to be aware not to misuse its power for risk allocation and unexpected scope changes.

From the point of view of the public client early involvement is not without danger. Given the limited number of private parties that are usually ‘early involved’, competition may die out early in the process of infrastructure development (Lenferink, 2013), such that a so called private monopoly position exists (Kwak, YingYi, & Ibbs, 2009). This can cause strategic behaviour, such as the ‘freedom’ the contractor has to determine the prices he imposes on the client.

Points of continuous concern: the differences between public and private

What is written above may seem to be straightforward, but is nevertheless difficult to achieve. The struggles with PPPs both public and private parties experience during the last two decades indicate this. The biggest struggle lies in the differences between ‘the nature’ public and private: ‘cultural and institutional differences’ (Van Ham & Koppenjan, 2001). Others point to the differences in values, strategies and core business between public and private (Klijn & Teisman, 2002). Also opportunism can turn out to be a danger. Opportunism can be diminished by creating trust relationships by means of interaction (Rufin & Rivera-Santos, 2012). Public agencies will have to overcome their preferences for formal procedures and emphasize the advantages of informal interaction and coordination with private parties (partners) especially even before initial agreement is achieved (ibid).

3.4 Market involvement in infrastructure replacement

What is the added value of market parties in infrastructure replacement in the Netherlands? This section describes the results derived from semi-structured interviews at both Rijkswaterstaat and market parties.

3.4.1 Redefining the role of client and contractor

Market parties in the Netherlands are especially skilled in tactical and operational tasks, i.e. design, construction and maintenance activities and have proven to be able to provide innovative and smart solutions (Ackermans, 2015; van der Velde, 2015). Strategic knowledge that is required for infrastructure replacement is however lacking (van der Velde, 2015), since the knowledge ‘the market’ develops is dependent on ‘where the money is’; the market will always move in the direction where the client guides them (Leendertse, 2015).³⁴ There is no ‘single’ market place, the supply of knowledge and products and number of market parties (hence degree of competition) differs per sector and type of market (Ackermans, 2015; Leendertse, 2015).³⁵ In case the client wants innovative solutions, these have to be requested from the market, i.e. a public client needs to know what products and knowledge of services the market need to develop (Ackermans, 2015; Bus, 2015).

The role of the public client is to both ‘shape’ the market in required direction, but also to lay down future challenges at the market. In order to determine this future challenges the public client needs to be aware of the future challenges himself, i.e. needs to know how the infrastructure system develops and how the functionality of the systems need to change (Bus, 2015; van der Velde, 2015).³⁶ In the most ideal situation the contractor(s) develop the knowledge that fits the knowledge gaps of the public client (Leendertse, 2015), even before the client is aware of this knowledge gap (Hombergen, 2015). Thereby the market party should be willing to take system responsibility. This means that a market party while deciding on the intervention activities to apply considers the impact of the decision on the systems of other stakeholders involved (van der Velde, 2015).³⁷ Much of the system knowledge, however, is

³⁴ Or the market sees a big opportunity to earn money and decides to invest in innovative solutions which it then offers to potential clients. History shows this is rarely the case in the Netherlands, the infrastructure market is relatively conservative to that extent (Leendertse, 2015).

³⁵ An example of this is the market for sluices, which is very knowledge intensive, traditional and clustered (Willems & Busscher, 2014a) and in this sense requires a tailor made market approach.

³⁶ For example: how much water will flow through the Rhine in 2050? (Bus, 2015).

³⁷ Intervention activities concern infrastructure management activities aimed at achieving a pre-defined results. Activities include maintenance, replacement, renovation, design and construction (see chapter 4).

gained at the operational level, by means of maintenance of the assets (Klatter, 2015; Deuring, 2015). A contractor needs time to get to know its object or network in order to be able to intervene in the network efficiently. When we place this in the context of replacement, the contractor can determine the impact of replacement and the impact of a replacement strategy and new design only, if it has managed the network over a considerable period of time. In the same line of reasoning it can be said that in order to anticipate the knowledge gap of the client, the contractor needs to go through a process of learning.

The consequence of what is stated above is that the role of the client changes. The client does not determine the scope of the projects in detail anymore. It will explore the scope of the projects together with the market parties. For example, client and contractor jointly determine what functions a new bridge should fulfil. Past experiences with early market involvement in this regard have proven to be very successful for both market parties as the public client Rijkswaterstaat (van Dijk, 2015). Rijkswaterstaat is more and more stepping back, giving market parties the initiative to develop interesting proposals (Hombergen, 2015).³⁸ The task for the client is then to what extent these fit its need. Giving market parties more responsibilities and freedom furthermore creates opportunities for innovative function combinations, especially if market parties are taking the wishes of the environment (stakeholders) into account (Ackermans, 2015). Infrastructure replacement thus requires the infrastructure manager to handover most of its tactical and operational skills to private contractors in order to let them develop system knowledge and stimulate smart, innovative and efficient replacement solutions. Connection with the operational level remains of crucial importance, since the achievement network goals will be largely dependent by decisions made at the operational level (van der Velde, 2015).³⁹ Chapter 5 will dive into the public-private task division regarding infrastructure replacement in detail.

3.4.2 Guidelines for public-private role division

Based on the semi-structured interview data, three guidelines for strategic infrastructure replacement can be formulated. These guidelines serve as input for the design of preliminary arrangements (see chapter 5).

Stimulating innovation: setting the boundaries, while still being flexible

The development of solutions for strategic infrastructure replacement thus requires the infrastructure manager to adopt a pro-active approach to the innovations it wishes to see developed; hence urging the need for ‘early’ dialogues with market parties in order to determine what is feasible. Replacement typically deals with long life times, while market parties the existence of market parties might be short. Technology change and development (materials, IT systems) evolve very rapidly. These factors create an urge for more adaptive planning and design. The public client needs to be aware of these developments and to ‘disseminate’ this need to the market. In the end it is the client that needs to agree upon the product that is being delivered.

When stimulating innovation the business case should be strong, that is the prospect for making profit should be positive. In practice this means that in order to invest in innovations, several roll out opportunities must be available (Ackermans, 2015; Bus, 2015), be it either determined or variable (optional, in case the first roll out is positive) (Hombergen, 2015). The client has to accept the knowledge of the market and accept it loses control over the final result. Giving freedom to the market gives the market the possibility to optimize the risks they expect to be able handle (Ackermans, 2015). Flexibility is an absolute requirement in public-private cooperation. Dividing the network in small contracts with long-term, forms and inflexible agreements further leads to little room for changing the infrastructure interventions in line with the ‘real time’ development of stakeholder needs and development of external factors, hence leaving policy makers with limited freedom to adapt and improve their policies (Schoenmaker, 2015).

³⁸ For more information on a current early market involvement initiative regarding tidal energy see Projectbureau Getijdencentrale Brouwersdam (2014) and Lenferink, Leendertse, et al. (2014). It needs to be stated that Rijkswaterstaat is searching which role to adopt and current initiatives are far from optimal.

³⁹ A sluice can be of top of the notch quality, however a lack of maintenance will significantly degrade the operational quality and may even lead to a disrupted corridor in case of failure.

Risks division and incentives: the core of cooperation

Public safety plays an important role concerning water assets. The consequences of failure will have such a high impact that no market party will be able to bear them (Hombergen, 2015). The art of shaping public-private arrangements is to align the goals of the public and private partners during the arrangement duration and keep them aligned. The client has the task to shape the behaviour of the market parties in accordance with the responsibility they are taking.⁴⁰ In essence, arrangements are all about (financial) incentives: 'steering' the private party in the right direction (Ackermans, 2015; Leendertse, 2015). Thereby, the arrangement should have flexibility to deal with possible changes in goal orientation of the private party. Other projects in the portfolio of the private party may change its goal in a particular project (Leendertse, 2015).

Committing yourself to one party is dangerous and can be considered the dark side of innovation. This needs to be prevented at all times (Bus, 2015). So, the client can both choose to involve multiple contactors or to incentivize the one-on-one cooperation in such a way that strategic behaviour is limited. In essence public-private cooperation is about dividing the risks smartly together, such that it leads to beneficial solutions for both public as private party (Hombergen, 2015). From this perspective the art of preventing strategic behaviour is continuously ensuring the alignment of the interests of both parties, such that pure cooperation is the only manner to receive maximal goal achievement. Mutual trust is essential for achieving this. The public party should do what it promises (Bus, 2015) in order to create and stimulate this trust relationship.

3.5 Conclusion

Real public-private cooperation requires a horizontal public-private relationship that is characterized by an informal and 'equal' relationship aimed at coordination and interaction. From the very start of the cooperation, client and market parties should interact frequently. In the very beginning the aim of interaction is to create trust, align goals and discover the opportunities for cooperation. The concept of early involvement is an example of how early client interaction may look like. Once common ground has been found and norms and values are shared, the 'real' cooperation can start, namely the joint exploration and formulation of project goals, scope and result which will most likely be generally defined.⁴¹ The same goes for the identification of risks and subsequent risk allocation. During the execution of the project, current alignment of activities and 'interests' is necessary in order to stay on track. Coordination and interaction are also required to give further detail to the scope, result and risk distribution.

Practitioners in the Netherlands involved in public-private cooperation in the Netherlands indicate the need and potential for public-private cooperation to be used for replacement. They hold a positive attitude towards handing over more responsibilities and tasks to market parties. A requirement for this is giving more freedom to the market parties. The role of the client is believed to be more like a network director that develops long-term visions and determines the performance goals infrastructure needs to fulfil. Close attention must be paid to handing over public responsibilities, since water assets are 'too big to fail' (Hombergen, 2015). Cooperation may also facilitate strategic behaviour of market parties, which create a need for 'suitable' arrangements. In order to make the public-private role division for infrastructure replacement more specific, the next chapter will identify the infrastructure management tasks and roles (bundling of tasks). Arrangement will only be of value if they are rightly placed in their context. Further context is the infrastructure management tasks that come along with replacement. These need further examination before arrangements can be defined.

⁴⁰ Shaping the behaviour of market parties such that part of the public responsibilities are handed over to market parties can be considered to be one of the biggest challenges Rijkswaterstaat will face in the years to come (Schavemaker, 2015; van der Velde, 2015). The crux is that some of these public responsibilities are required over to be handed over to private parties in order to realize the benefits of more market involvement (see chapter 4). The trade-off between control and freedom once again comes into play here and takes in this situation the shape of a dilemma.

⁴¹ In this research the term 'project' resembles the joint effort public client and private contractors undertake in order to achieve the joint purpose. This use of the term project differs from the 'classic project definition' that states that a project resembles a clearly defined set of activities aiming at a clearly defined goal, result, scope and time budget (Nicholas & Steyn, 2012).

4. Identifying the replacement tasks as a basis for public-private allocation

This chapter will start with identifying the management tasks involve in managing infrastructure assets based on asset management literature (section 1). Guidelines on asset management decisions making (section 2), combined with identification of interfaces of asset management tasks (section 3) will complete the replacement tasks framework. Based on data from the semi-structured interviews concerning the replacement context in the Netherlands, section 4 provides replacement guidelines for effective replacement. Finally, the replacement roles will be presented in section 5, which will form the basis for public-private allocation of infrastructure replacement tasks.

4.1 Identification of infrastructure management tasks

The asset management literature reveals five main infrastructure management tasks. These tasks aim for providing the asset manager with relevant decision information, such that for every intervention decision to be made the consequences on costs, quality (performance) and risks can be determined (Moon, Aktan, Furuta, & Dogaki, 2009). This is what I call efficient and effective decision making.

Task 1: Goal setting and performance management

Goal setting is the most essential infrastructure management task, since the formulation of long-term, goals and objectives is considered to be the starting point of the management process (Too, 2010). Strategic goals are general formulated goals and often relate to the highest system level that is the strategic level which covers networks and a long time horizon. An example of a strategic goal can be: “Quick and safe inland shipping transport in 2040”. The strategic goals ought to determine the objectives on the tactical and operational level (Parida, 2012) and thereby also the design, construction and maintenance of the objects. Strategic goals in itself are not measurable and need therefore operationalisation. Performance based management of infrastructure is believed to contribute positively to infrastructure management: it allows to set performance targets, measure and monitor those and use these metrics in infrastructure management decision making (Moon et al., 2009) and is thereby valuable for infrastructure replacement.

What are the requirements for effective goal and performance setting? First, the long-term (strategic) goals and objectives should be based on organizational stakeholder requirements (Too & Too, 2010). Second, the goals and performance targets of the assets should be in line with the organizational purpose and goals and available resources (Too, 2010).⁴² Third, a strong line of sight should be used. That is, the goals at the strategic level should be translated to the tactical and operational level and should be aligned (The Institute of Asset Management, 2014): what do the long-term, subjective goals mean for a specific object of groups of objects and which operational measures resemble these goals best? (Neumann & Markow, 2004; Parida, 2012). This alignment also entails the formulation of an asset management strategy which is a plan that ensures the long-term goals are realized by the assets.⁴³ At the operational level these goals are translated into lifecycle means, such as maintenance plans. Fourth, the strategic goals should be feasible and take the current state and performance of the object into account, which implies a feedback structure from the operational level back to the strategic level (Lenferink et al., 2013a). Figure 9 shows the relations and hierarchy between the goals and objectives, including a real life example of the Rijkswaterstaat initiative ‘fast and safe transport’ (Rijkswaterstaat, 2015).⁴⁴

⁴² An often used term in this context is *policy* or *asset management policy* (see Moon et al., 2009; The Institute of Asset Management, 2014). A *policy* ensures that the general asset management goals are aligned with and contribute to the organizational strategy. The assets thus are a means to reach a general objective (such as increase the sustainability of transport).

⁴³ An *asset management strategy* is a further specification of the *asset management policy*, which translates the (general) goals, to specific objectives for the *asset portfolio*, in terms of costs, risks and performance measures (The Institute of Asset Management, 2014).

⁴⁴ In Dutch: Vlot en Veilig Verkeer over het water.

Task 2: Budget allocation and planning

The investment decisions should be made according to the life-cycle cost principle (Too, 2010), which means that each investment alternative, whether concerning design, construction or maintenance, is based on the costs of the infrastructure management activities over the (remaining) lifetime of the asset(s) (Hastings, 2010). Decision making also incorporates making budgets available and the allocation of this budget for long-, mid- and short-term time periods (Moon et al., 2009). An important requirement for effective decision making is that the decision maker also addresses the development of external factors and has the means available to deal with them (Schraven, Hartmann, & Dewulf, 2011). Planning can both entail strategic (long-term) planning as well as tactical and operational planning and concerns all activities from plan and programme development until maintenance. Strategic planning concerns ensuring that the different asset groups are meeting the future demand, for example by means of using scenario analysis (The Institute of Asset Management, 2014). At the tactical and operational level the assets are managed in line with the lifecycle management principle, which means that it is decided upon whether to replace an asset, what maintenance concepts to apply, and determining the new capacity of an asset when replacing (ibid).

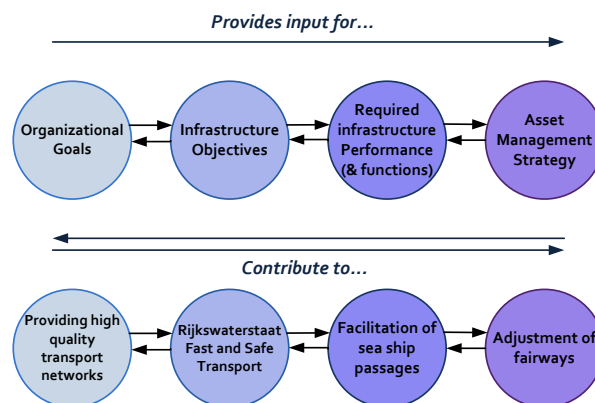


Figure 9 Relation between infrastructure goals and strategic asset management (developed by researcher, based on Rijkswaterstaat, 2015; Too 2010)

Task 3: Monitoring and evaluation

Monitoring of asset performance and asset condition is necessary in order to determine whether the goals and targets have been reached and to determine how the network (system) can be improved. Also costs can be monitored as well as the development of strategy achievement (Moon et al., 2009). In order to achieve this, objective data collection is an absolute must. Furthermore, the data should be accessible to those making the decisions. Evaluation and feedback should occur on a regular basis, since environmental circumstances may change and affect the required and current performance of systems and assets (Verlaan & Schoenmaker, 2013). The evaluation criteria should be derived from the infrastructure objectives (Schraven et al., 2011). Monitoring and evaluation also contribute to improving the management process; asset management is in principle an approach that strongly advocates learning (Too, 2010; Wijnia et al., 2014), which once more indicates the importance of the interfaces between strategic, tactical and operational level. Monitoring also facilitates quick restoration of failures (Schraven et al., 2011). The last function of monitoring concerns identification of trends (Neumann & Markow, 2004), for example with regard to cost development of maintenance activities. Figure 10 shows the relation between the strategic, tactical and operational performance measurement indicators.

Task 4: Forecasting

Forecasting is especially relevant for the strategic level, since it entails the long-term forecasting of the future need and development of external factors and thereby provides valuable input for long-term decision making. In this sense forecasting is used to determine what performance and functions are required in the future. Thereby forecasting really becomes of added value when done by means of detailed measures that are aligned with the performance measures (Moon et al., 2009). The long-term forecasts can be ‘translated’ to the midterm and hence be used for

design and construction decisions. At the operational level forecasting can help to determine the maintenance need of an asset (Márquez et al., 2012).

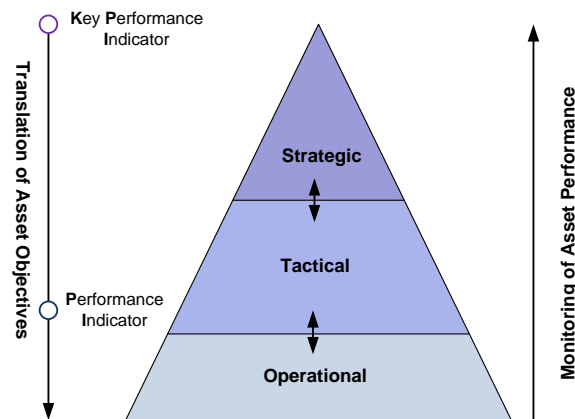


Figure 10 Measuring and monitoring asset performance (based on Parida, 2012)

Task 5: Risk Management

Given that the infrastructure objects are static (have a long lifespan), ensuring that the system meets the demand comes down to risk management: given the current capacity of the object how and with what chance can the demand be met? (Herder & Wijnia, 2012) At the strategic level risk management consist of setting the acceptable risk levels, for example the likelihood of a life threatening flood.⁴⁵ In line with the *line of sight* principle, these acceptable risk levels need to be determined for each object. It is beyond the scope of this research to determine the risk management process in depth. For more information see Herder & Wijnia (2012).

Table 9 provides an overview of all infrastructure management tasks in line with the descriptions above. All tasks are split out to the operational, tactical and strategic level, such that the interfaces between the tasks are clear. Furthermore each task subtasks are formulated, which are ordered to the strategic, tactical and operational level, in accordance with the asset lifecycle. Hence, the framework provides a holistic and very useful basis for infrastructure management in general and asset replacement in particular.

4.2 Guidelines for infrastructure asset management decision making

The replacement decision is in essence an infrastructure asset management decision. Hence, guidelines for efficient and effective asset management may contribute to cost efficient and cost effective replacement of water infrastructure objects. This section provides guidelines for asset management decisions, which concern all intervention decisions covering the complete life-cycle of an object. It is believed that these guidelines for decision making also resemble the guidelines for an effective asset management task allocation.

Decision making is the binding force that connects all management tasks and hence deserves special attention. According to Schraven et al. (2011:66) decisions in infrastructure management cover the following categories:

1. Decisions on the formulation of infrastructure objectives: Goal and target setting (see task 1, section 4.1).
2. Decisions on the formulation of performance measures: as input for performance evaluation and assessment of the state of the infrastructure.
3. Decisions on the interventions applied to the assets: selection of intervention measures to execute, including the selection of projects.

⁴⁵ For more asset management risk related principles I refer to Herder & Wijnia (2012). Leendertse (2015) investigated public-private risk allocation for infrastructure network development and management.

Table 9 Infrastructure management task framework (developed by researcher)

Task category	Task	Strategic			Tactical			Operational		
Goal setting and performance management	Formulation and alignment of objectives	Formulation of long-term, general infrastructure objectives (policy)			Translation of strategic objectives to measurable midterm objectives			Translation of tactical objectives to maintenance & operation objectives		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
	Formulation of performance targets	Formulation of long-term performance measures and target values			Translation of top level performance measures to network and object level performance indicators			Translation to maintenance and operation (object) performance indicators		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
Budget allocation and planning	Investment decisions (capacity) and budget allocation (prioritizing)	Long-term total investments based on lifecycle cost			Investment strategy including decisions on planning (and replacement) based on LCC			Maintenance investment concept based on lifecycle costs		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
	Capacity planning	Long-term network capacity planning based on future need and external factor change			Planning of design and construction (and disposal) for all objects in network			Maintenance planning		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
Monitoring and evaluation	Data collection: formulation of data performance indicators	Formulation of long-term KPI's			Formulation of data strategy (collection) based on top level strategic goals			Data collection and communication protocols		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
	Condition and performance monitoring	Data Integration to complete (national) network			Gathering of data and integration from operational level for performance management			Maintenance and operation performance measurement		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
	Evaluation of 'asset strategy'	Evaluation of performance goals and total investments			Evaluation of design and construction (replacement) planning			Evaluation of maintenance planning		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
Forecasting	Identify future performance (stakeholder) need	Identify long-term performance need			Identify mid-term performance need			Identify short term maintenance need		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
	Forecast development of influencing (external) factors	Forecast long-term development of external factors			Determine mid-term impact of external influence			Determine impact on maintenance		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
Risk Management	Risk profile formulation	Top level acceptable risk setting			Translation to acceptable risk for mid-term			Translation to short term maintenance need		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object

Of special importance are the interfaces between the tasks. That means that input and output of the several tasks are intertwined, hence these tasks need coordination. The following requirements for efficient control of assets can be formulated (Schraven et al., 2011; Verlaan & Schoenmaker, 2013):

1. Intervention decisions should be based on current performance of the assets and future required performance, which is in turn a result of future 'preferred' performance and required performance due to the development and impact of external factors.
2. The impact of the intervention decisions should be evaluated and monitored according to the current state infrastructure object, hence contribute to the infrastructure objectives.
3. The entity that makes the intervention decision should have the means and power available to deal with future uncertainties (i.e. development of external factors).
4. The evaluation criteria for the decisions being made should be derived from the infrastructure objectives, and also include parameters that determine the external influence on the infrastructure objectives.
5. Infrastructure objectives and performance targets should be monitored and evaluated continuously.

The requirements show that the decision making entity always needs to have the most actual information available and need to be aware of how the decisions at hand contribute to the strategic objectives. What is right cannot be determined in the context of infrastructure management; decisions will always involve trade-offs between costs (investments) and risks (Moon et al., 2009). Therefore, for every decision at hand the decision maker should have all information available to balance these trade-offs. These are the essential guidelines for effective infrastructure management. Now the tasks and guidelines for efficient decision making are clear the tasks can be divided.

4.3 Relations between management tasks: a strong need for alignment and coordination

The section above implicitly showed the relations between the infrastructure management tasks. This section will make them explicit with the aim to identify the important interfaces between the tasks. These interfaces are important for efficient decision making with regard to the intervention activities to perform, such as deciding on the replacement moment of the objects. As was indicated in the foregoing section, the asset management methodology will only work if all relevant information for making these intervention decisions is available. Hence, the interfaces must be leading in determining the public-private task division for infrastructure replacement. The interfaces between the tasks are given in figure 11 and are described below.

Goal setting and performance management can be considered the key task, given the relations with the other tasks. The formulation of strategic (long-term) goals can be considered to be the starting point of the infrastructure management process (Schraven et al., 2011). The goals determine which performance measures need to be monitored and forecasted. The goals influence the budget allocation heavily, since they determine which assets (and functions) will be prioritized. The strategic goals should be based on both the long-term development of external factors, since they determine what is possible and the current state and current performance of the assets in order to make feasible goals and alter them if necessary (Moon et al., 2009; Parida, 2012). The (strategic) goals and targets also determine the acceptable risk profiles being taken, especially when considering the budgets available. Planning activities should be focused on bridging the performance gap between the current situation and the future (desired) situation.

What do these tasks imply for network performance? All intervention activities influence system performance, hence all intervention activities should be aligned.⁴⁶ Alignment can only occur if all intervention decisions are made based on the same evaluation criteria and hence serve the same goals. Also the current state of the assets should be available at all time. Hence, coordination among management tasks and above all integration of all tasks is required. For replacement this means that the decision to replace is aligned with the maintenance decisions. It also means that

⁴⁶ All intervention activities entails the strategic, tactical and operational activities. Maintenance needs to be aligned with the decisions to replace for example. It is a waste of money if object elements with a 20 year lifetime are replaced, if the object itself is to be replaced within 10 years.

replacement should contribute to the strategic goals, and that all relevant data should be available to make these decisions, including the impact of replacement on future network performance, while accounting for the development and impact of external factors, such as the development of inland shipping values and water heights. The influence of the management tasks on system (network) performance is indicated in figure 12.

It must be stated that this asset management approach to infrastructure replacement resembles a rather rational perspective to infrastructure management decision making. For example, in reality the goals and objective formulation will be largely influenced by political factors, as will be the prioritization of goals and intervention activities. Nevertheless, the asset management ‘philosophy’ provide valuable guidelines for how replacement can be organized efficiently, hence is worth striving for. The next section will present guidelines for the public-private task allocation given the context of replacement.

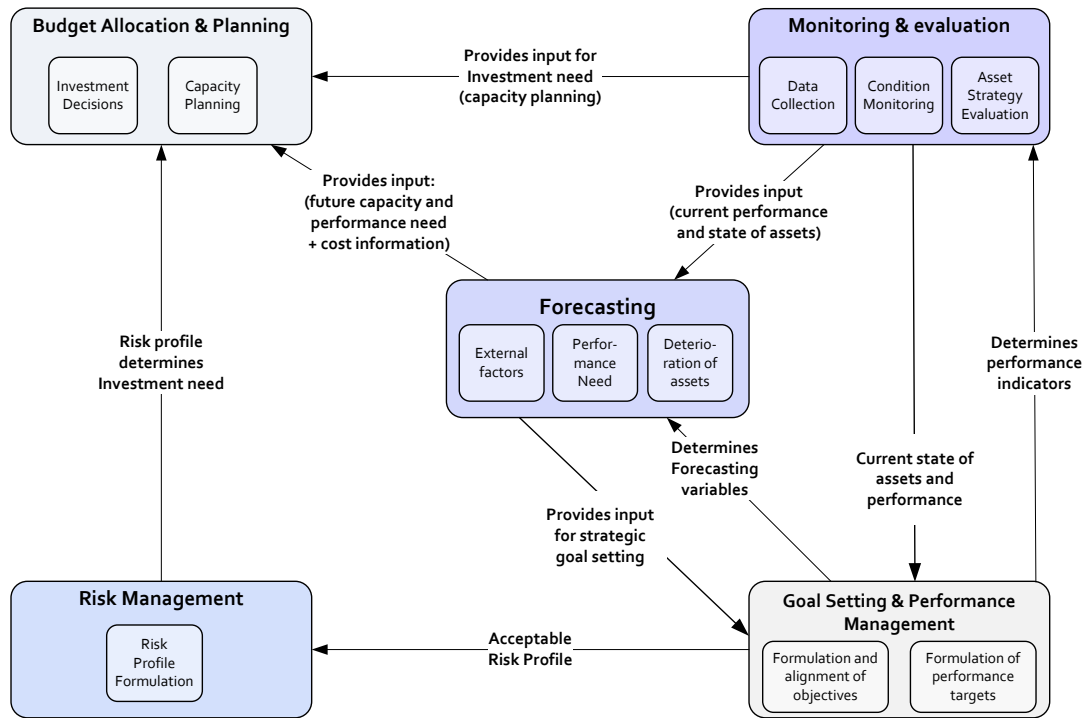


Figure 11 Relations between infrastructure management tasks (developed by researcher)

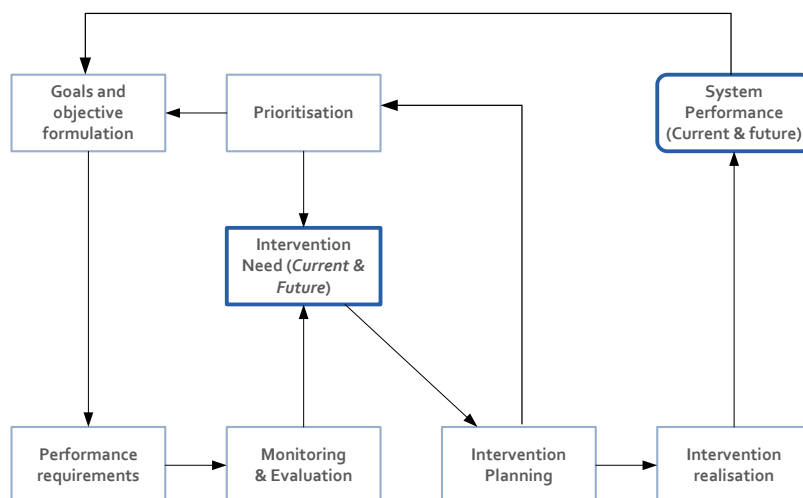


Figure 12 Influence of tasks on system performance (developed by researcher, partly based on Schoenmaker & Verlaan, 2013)

4.4 Guidelines for replacement from an asset management perspective

Guidelines for replacement are presented in this section, with the aim to further specify the public-private task allocation. These guidelines are formulated based on the explorative interviews with practitioners (see section 2.5).

Guideline 1: Define and formulate clear criteria for replacement

There is no single right replacement moment. The end of lifetime of an object is dependent of the criterion being used and can be ‘dynamic’ (i.e. can change over time) due to changing performance requirements. These changes can both stem from a change in external factors (increasing water levels), as a change in usage: increased ‘load profile’. An object can be replaced based on three different criteria (Deuring, 2015; Klatter, 2015; Schavemaker, 2015):

1. ‘Technological lifetime’: replacement based on the design lifetime of the asset.
2. ‘Functional lifetime’: replacement based on the disability of the object to fulfil the functions it was designed for, in its current environment.
3. ‘Economical lifetime’: replacement based on costs: replacement is more cost efficient than life-time extended maintenance (or the application of other intervention measures).

The differences between these criteria are explained in the intermezzo below.

Intermezzo: dynamic nature of infrastructure replacement

The basic idea behind a replacement is that the object does not achieve the performance criteria (performance gap) that are required. The performance criteria for an object can be based on the requirements it need to fulfil. This may be because the object does not function well within the system anymore, that is it does not meet the requirements that are expected from the network performance requirements (*internal performance gap*) or because it is not able to fulfil the function the stakeholders require (*external performance gap*). A perceived performance gap is not the only requirement for replacement. Replacement will only take place if sufficient resources are available.

The technical lifetime thus concerns the functioning of the object itself, while the functional lifetime concerns the functioning of the object in its network. The following example of a lock⁴⁷ will make the distinction more clear. The main function of a lock is to transfer ships from one water height to another. A design requirement for a lock can be that it should be able to transfer a ship within a time period (minutes) in order to realize a maximum throughput capacity of ships (ships/day).⁴⁸ The technical design will be such that the object will be able to handle this capacity. The lock will reach the end of its technological lifetime if the components that contribute to the capacity performance do not reach the capacity objective. When does the lock reach the end of its functional lifetime then? This is when the (maximum) capacity of the sluice cannot meet the capacity objective that is needed to meet the infrastructure objectives. Thus, an infrastructure object can reach the end of its functional lifetime before it reaches the end of the technical lifetime. What this example indicates is that the technical lifetime mainly concerns the object itself, while the functional network is more dependent on the environment of the object.⁴⁹ The right moment to replace an infrastructure object may thus be variable based on the function it ought to fulfil and the accompanying performance that comes with it.

Several feedback loops are involved in infrastructure replacement and thereby indicate the dynamics involved in infrastructure replacement: there is not optimal replacement moment. The *object performance and replacement loop* indicate the feedback mechanism involved in replacement: replacement aims to improve the object and network performance, in order to fulfil the needs of the stakeholders involved. The feedback loop is however characterised by a major delay, namely between the need for replacement and the actual object replacement. Once in place, infrastructure objects are not easy to replace. This once more indicates the need to replace smartly. Smartly here means adaptively with regular monitoring of performance and the state of objects.

⁴⁷ ‘Schutsluis’ in Dutch.

⁴⁸ The capacity objective can stem from a higher level goal, for example ‘to increase the freight capacity of barge transport’, which can be derived from the goal to increase the attractiveness of barge transport compared to other modalities in order to decrease congestion levels of road traffic.

⁴⁹ This statement does not completely hold true. Imagine that the traffic that crosses a bridge unexpectedly increases significantly, then this will have consequences for the degradation of the construction quality. Also the covering layer of the road have to be refurbished earlier.

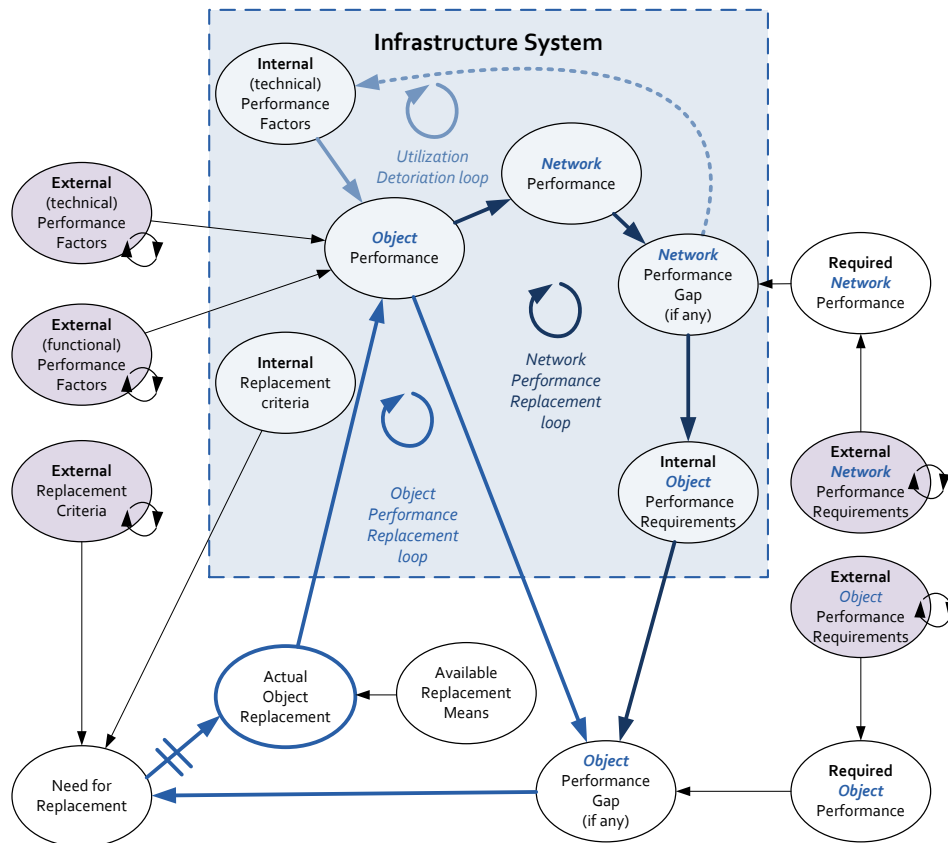


Figure 13 Overview of replacement process based on object performance (developed by researcher)

Guideline 2: Replacing is a deliberate decision hence requires anticipation

The long lifetime of objects both imply that the exact replacement cannot be determined and hence need to be forecasted while accounting for the impact and development of external factors. The many components the objects consist of make that over the complete lifetime of the object, several other components need to be replaced (Bus, 2015; van der Velde, 2015).⁵⁰ The need for replacement can be determined from the strategic goals and objectives: the required quality of the infrastructure networks and required functionality.⁵¹ Therefore, the replacement moment of the complete object therefore to be chosen smartly in order to minimize costs. Because the replacement moment is variable and also depends on the maintenance of the objects (lifetime extension), all tactical and operational decisions with regard to component replacement and maintenance need to be coordinated over the complete lifetime of an object. Smartly replacing and programming replacement of assets can thus also be done by means of smartly bundling the replacement of objects (van der Velde, 2015). A disadvantage of the pro-active approach is that it requires cooperating with market parties for longer periods of time (i.e. more than 30 years). Market parties unfortunately do not exist that long (van der Velde, 2015).

Guideline 3: Use a network approach for managing replacement

The performance and functioning of objects is highly dependent upon the other objects it is connected with. Replacing one sluice in a network will influence the performance of the other objects. A corridor is as strong as its weakest link. Much is to gain by adopting a network approach. The idea behind a network approach is to divide the

⁵⁰ The lifespans cycles of the components each have their own 'dynamics', hence making it possible to smartly bundle the replacement of these components (van der Velde, 2015).

⁵¹ The required 'quality' of a corridor need to be derived from infrastructure policy: given the policy goals and performance targets, such as high availability and throughput capacity set for the national network, the performance requirements for a specific corridor (network branch) can be determined. These can in turn be translated to objects and hence the need for replacement can be determined (Deuring, 2015).

total network (or system) in independent parts.⁵² These parts consist of a bundle of objects that together function independently (Leendertse, 2015). Using a network approach may lead to more cost effective investments: the objects which are most critical for the performance of the network could be prioritized, instead of optimizing each object individually (Deuring, 2015). Furthermore, the impact of replacement on network performance can be determined (ibid). The network (or corridor) perspective furthermore offers more room for flexibility to optimize the replacement and improve the system. A network perspective also forces the decision maker to think about future performance and functions. Besides, the network perspective fits the coordination need between the strategic, tactical and operational decisions. Long-term goals are often formulated in terms of functions and network performance targets. The moment to replace is a derivative from these long-term goals.

Guideline 4: Replacing is a moment of opportunity, chose it wisely and use a ‘tailor-made approach’

The moment to replace is also an opportunity to change the system or to change the functionality of objects (van der Velde, 2015; Schavemaker, 2015).⁵³ In this sense replacement is a window of opportunity: it creates new chances for system improvement and also provides a chance to satisfy new needs of the stakeholders and local infrastructure managers involved. This involvement is also necessary to create sufficient support and financial means for the replacement. The replacement moment furthermore is a moment to evaluate the worth of an object for an infrastructure manager: Rijkswaterstaat can determine to hand over the object to a regional or local manager (van der Velde, 2015). When replacing the needs from the ‘environment’ the object is part of, need to be identified and satisfied: how can the object be ready for the future, but also how can the network be ready for the future? What functions and which performance are required? Replacement is also the right moment to decrease life cycle costs of an object by means of smartly bundling the design specifications with innovative maintenance and operation concepts.

4.5 The advantage of bundling asset management tasks for infrastructure replacement

Based on the identification of asset management (sub)tasks, their relations (interfaces) and the replacement guidelines above, six conclusions can be drawn for the efficient replacement of infrastructure objects. First, decision making on replacement should start with formulation of the overall strategic goals and examining the contribution of the performance of the each asset to the performance of the network the asset is part of. Strategic goals should be realistic and based on both assessment of development of external factors and current asset and network performance. Second, the decision maker should have in depth knowledge of all functions and elements an object consists of, the lifetimes of these elements and contribution to the asset performance. Third, asset information concerning asset performance and the state and functioning of the asset should be available at all times. This information should include the expected remaining lifetime now and in the future. Future performance expectations need to result from both forecasting of the impact of external factors to these (i.e. development of the “system”) and the identification of stakeholder requirements. Fourth, the decision to replace should be aligned with other intervention decisions and activities, hence covering the complete lifecycle of an asset. For each decision the impact on the asset goals should be known. Fifth, asset performance should be continuously monitored and intervention decisions should be regularly evaluated. Performance goals should be adapted if necessary in order to keep them realistic and aligned to the budget available. Sixth, the decision maker should be informed about the needs of local stakeholders and fellow infrastructure managers and incorporate their interests and needs in intervention decisions, in order to achieve the strategic goals.⁵⁴

What can we learn from this? Above all that many tasks on the strategic, tactical and operational level need to be aligned and closely coordinated in order to ensure all intervention activities contribute to the strategic goals and

⁵² Independent parts or corridors are for example a part of the Maas, IJssel or Rijn River (Bus, 2015).

⁵³ The renovation of the Afsluitdijk lead to the opportunity to add a ‘fish migration’ function (Rijkswaterstaat, 2012b).

⁵⁴ Due to the ever existing need of public investment in infrastructure, at least in the Netherlands, incorporating stakeholder needs will always be a case of prioritizing. The challenge is to do this smartly such that replacement opportunities (‘meekoppelkansen’) can be achieved.

resources and effort are parsimoniously used.⁵⁵ The holistic approach of asset management requires serious performance measurement skills. Due to the need for strong alignment and coordination between these tasks, it is considered to be efficient to bundle as much infrastructure management tasks as possible. For example, monitoring and evaluating maintenance performance is required to improve the maintenance activities. This learning effect can only be achieved if the entity responsible for drawing the maintenance plans has the data available to evaluate the maintenance performance, knows the performance requirements (i.e. maintenance goals) and knows how these align with the tactical and strategic goals. Using the same line of reasoning it can be stated that in order to implement a lifecycle perspective on infrastructure management, the line of sight that provides the overview of performance decomposition from the strategic to the operational level can only be achieved is essential for making every intervention decision. If we, again, follow this line of reasoning towards the issue of market involvement in infrastructure network management it can be stated that it is potentially beneficial to involve as little contractors as possible and to opt for long-term contracts.⁵⁶

4.5.1 Formulation of asset management roles by bundling asset management tasks

Bundling of infrastructure management tasks is considered to positively contribute to the efficient replacement of infrastructure objects, because less coordination and interaction is required and all important interfaces as indicated in section 4.3 are allocated by one party. A close examination of the task interfaces lead to the following bundling of tasks and creates five roles: stakeholder involvement, synchronization, internal coordination and external coordination. These tasks are described and explained below. Table 10 visualizes the bundling of tasks, including a selection of ‘essential replacement tasks’.

Stakeholder involvement (SI)

Stakeholder involvement relates to the identification and prioritization of stakeholder needs in the process of infrastructure management and the strategic, tactical, and operational level. At the strategic level stakeholders can provide input for the long-term (re)design of the complete network. Furthermore, stakeholders can financially contribute to the replacement of assets.⁵⁷ The tactical level relates to the replacement of the objects, including the replacement moment. Providing input at the operational level covers the maintenance planning and execution. The party responsible for identification will also be responsible for prioritization.

Synchronization (S)

Synchronization entails both the identification of the needs of the local infrastructure manager as well as the coordination of intervention activities and adjustment if necessary. Often, local infrastructure managers are responsible for one or more elements of an object, such as the road that crosses a bridge. Hence, replacement touches their interest. At the tactical level synchronization implies the coordination of the replacement moment, but also the identification of design requirements of the new objects. The design of the new object will influence the maintenance need afterwards, which can lead to less maintenance costs and hence may unlock additional financial resources for object construction. At the operational level coordination of maintenance activities and maintenance is required and may also lead to synergy effects.

Internal coordination (IC)

⁵⁵ From this perspective it might be very interesting to conduct research into the opportunities combining the ‘lean philosophy’ with asset management methodology, as Baarends (2015) found in her thesis research that applying the lean philosophy to the client requirements specification process could reduce the waste in the early phases of infrastructure project development significantly.

⁵⁶ In the current situation multiple market parties are involved in day-to-day management of a network, each having a short term contract (5-7 years) (Deuring, 2015; Michon, 2015). Each contractor will hence optimize its ‘own’ asset and opt for short term optimization measures. Besides, there is no overview of the ‘bigger picture’. The client has serious problems with performance formulation (Michon, 2015) and data gathering, since the contracts are heavily ‘price-oriented’, hence result in a strong principle agent relationship thereby leading to very inefficient spending of resources (Algemene Rekenkamer, 2014).

⁵⁷ A very good, recent example of the ability of stakeholders to contribute financially to a large infrastructure project, while gaining influence in return is the new sluice that will be built at IJmuiden. Rijkswaterstaat initially planned to replace the sluice in 2029 (technological end of lifetime), however the Municipality of Amsterdam and the Province of North Holland paid €188 million to let the replacement take place at 2018 (Leoné, 2015).

As the name already indicates, internal coordination relates to the coordination of activities within the network, such that the network performance goals are achieved. This task is therefore by nature tactical and operational oriented. It concerns the alignment of maintenance, construction, design and replacement activities in accordance with the tactical performance measures. Hence, all ‘executive’ replacement activities related to asset replacement are bundled and in the hands of one party.⁵⁸ This party determines the replacement moment, is responsible for the actual replacement of the assets, determines the maintenance need and planning, and determines the investment need that is required to achieve the network goals. Furthermore, internal coordination implies the identification of the external factors that influence the performance of the assets and the subsequent forecasting of the development as well as the impact assessment of these factors. The performance goals for all these intervention activities will be derived from the strategic (inter-network) goals and will be translated to the required performance for the network and assets.

External coordination (EC)

This task concerns the coordination of the performance of the particular network in question with neighbouring networks on a national level. For example, the Meuse River can be divided into three ‘networks’. The external coordination then relates to the coordination of the performance of these networks, such that they contribute to the national goals to be achieved.⁵⁹ This task mainly involves the national level and hence mainly falls outside the scope of this research. The external coordination will hence be limited to the tasks that directly influence the other roles, such as the formulation of network performance goals based on inter network performance goals (see table 10).

The four roles as defined above create more structure to the replacement tasks and are also ‘practical’ for investigating which replacement tasks are to be ‘given’ to market parties and which could better be publicly owned. Despite the bundling of tasks, overlap could not have been prevented. A couple of tasks belong to several roles, for example the evaluation of design and construction (replacement decisions), since this decision will also influence the performance of objects in other networks, be it only for the disruption caused by replacement (ships will have to use a bypass route). This has consequence for the allocation of tasks, namely that coordination between these need to be arranged. Now the infrastructure management roles are clear, it is time to discuss the allocation of these roles: how should the public-private role division for replacement look like? This question will be answered in the next chapter.

⁵⁸ The ‘non-executive tasks’, such as the identification and prioritization of needs are part of the S/SI tasks.

⁵⁹ An even more detailed example: The Minister of Infrastructure and the Environment would like to increase the modal share of inland shipping on the route Rotterdam – Germany (the port’s hinterland), hence requires the maximum shipping time between Rotterdam and Duisburg to not exceed a certain time limit. This will have consequences for the capacity and ‘throughput’ time of the sluices along this route. The network these sluices are part of will be assigned a certain time value in order to contribute to the Minister’s goal.

Table 10 Overview of replacement tasks and role division (developed by researcher)

Task category	Task	Strategic			Tactical			Operational		
Goal setting and performance management	Formulation and alignment of objectives	Formulation of long-term, general infrastructure objectives (policy)			Translation of strategic objectives to measurable midterm objectives (EC/IC)			Translation of tactical objectives to maintenance & operation objectives (IC)		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
	Formulation of performance targets	Formulation of long-term performance measures and target values (EC)			Translation of top level performance measures to network and object level performance indicators (EC/IC)			Translation to maintenance and operation (object) performance indicators (IC)		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
Budget allocation and planning	Investment decisions (capacity) and budget allocation (prioritizing)	Long-term total investments based on lifecycle cost (EC)			Investment strategy including decisions on planning (and replacement) based on LCC (S/IC)			Maintenance investment concept based on lifecycle costs (IC)		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
	Capacity planning	Long-term network capacity planning based on future need and external factor change (EC)			Planning of design and construction (and disposal) for all objects in network (S/IC)			Maintenance planning (IC)		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
Monitoring and evaluation	Data collection: formulation of data performance indicators	Formulation of KPI's			Formulation of data strategy (collection) based on top level strategic goals (EC/IC)			Data collection and communication protocols (IC)		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
	Condition and performance monitoring	Data Integration to complete (national) network (EC)			Gathering of data and integration from object level for performance measurement (IC)			Maintenance and operation performance measurement (IC)		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
	Evaluation of 'asset strategy'	Evaluation of performance goals and total investments (EC)			Evaluation of design and construction (replacement) planning (EC/IC)			Evaluation of maintenance planning (IC)		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
Forecasting	Identify future performance (stakeholder) need	Identify long-term performance need (SI)			Identify mid-term performance need (SI)			Identify short term maintenance need (SI)		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
	Forecast development of influencing (external) factors	Forecast long-term development of external factors (EC/IC)			Determine mid-term impact of external influence (EC/IC)			Determine impact on maintenance need and operation performance (IC)		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object
Risk Management	Risk profile formulation	Top level acceptable risk setting			Translation to acceptable risk for mid-term (S/SI/IC/EC)			Translation to short term maintenance need (IC)		
		(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object	(Inter)Network	Network Branch	Object

Note. The tasks (cells) that are coloured and of which the task description letters are printed in bold type are of special importance for replacement.

5. Division of infrastructure replacement roles: role division and arrangement alternatives

The foregoing chapter concluded with four infrastructure management replacement roles. Now it is time to determine the public-private allocation of these roles and the subsequent public-private arrangement describes the client-contractor relation and for this reason ‘gives more body’ to the role division. The first section briefly discusses the possibilities for public-private role division. Next, possible arrangement element values will be presented in section two. The final section of this chapter presents three alternatives, which consist of a public-private role division which is combined with an ‘appropriate’ public-private arrangement.

5.1 Public- private task allocation alternatives

The division of the four roles presented earlier (internal coordination, external coordination, synchronization and stakeholder involvement) form the basis of the division of roles and tasks. All of these tasks can be either in public or in private hands. As became clear from table 10, synchronization and internal control are closely related. It is therefore advised to let one party be responsible for these tasks. Given the importance of external coordination and the close link with policymaking (and the risks involved in this), I dare to state that this role is better taken care of by the public party. This leaves internal coordination and stakeholder involvement to be decided upon. Strong emphasis of both theory, practitioners and experts on bundling internal control tasks and private involvement for the tactical and operations tasks, the internal control tasks are handed over to the private parties. Stakeholder involvement will be the variable on which the arrangements mainly differ. Private parties are expected to be able to involve stakeholders themselves (van der Velde, 2015). Table 12 shows the overview of possible variations of the role divisions. These are the task alternatives that will be examined in the remaining part of this research. The third alternative is a hybrid form of the first two. The alternatives will be explained in detail in section 5.3.

Points of concern for public-private task allocation

It is important that the evaluation criteria up front are defined and agreed upon, in order to prevent a disturbed client-contractor relation afterwards. Mutual trust is the most elementary requirement of good cooperation as we have seen in chapter 2. The development of external factors needs to be done jointly in order to define the risk profile. Evaluation of intervention activities, such as maintenance works, should always be done independently, such as to safeguard the objectivity of the evaluation of goals and the performance of assets. Since infrastructure objectives are often difficult to translate unambiguously (van der Velde, 2015), a public - private dialogue on the performance indicators of the agreement and their values is necessary (i.e. a dialogue on the expected performance of the network in question, in accordance with (strategic) policy goals).

Table 11 Overview of task alternatives

	Stakeholder involvement	Synchronization	Internal coordination	External coordination	EC/IC
Alternative 1	Public	Public	Private	Public	Private (Public)
Alternative 2	Private	Private	Private	Public	Private (Public)
Alternative 3	Public / Private	Public / Private	Private	Public	Private (Public)

Note. EC / IC = External coordination / internal coordination

5.2 The identification of ‘suitable’ arrangement element values

The arrangement framework as was presented in figure 8 covers a wide range of element values and as a consequence numerous possible arrangement alternatives. In order to keep the search for ‘suitable’ public-private arrangements manageable, demarcation of element values is required. This will be done based on the results from the semi-

structured interviews and the requirements for cooperation and early market involvement (see section 3.2). The element values considered suitable for efficient replacement are described below and visualised in figure 12.

Element 1: participating parties

The first question is: need stakeholders and fellow managers be part of the arrangement? Two options are possible: a) they 'stand outside' the arrangement, but the arrangement contains incentives and mechanisms for involving them; b) they are part of the arrangement as participant, whether with equal rights and power position to the client and contractor or not. The number of private parties can be chosen to be one or several. Given the strong interdependency of asset management tasks, the number of private participants need to be limited (Leendertse, 2015). On the other hand managing a complete 'wet' network requires a variety of skills which hardly can be found by one private party (Klatter, 2015). A managing agent construction is also possible, which means that one contractor bears final responsibility, however is allowed to involve subcontractors on its own account.

Element 2: Relationship *inter partes*

The advised early contractor-client dialogue in order to determine the required performance indicators and levels, and the joint risk identification requires more equal power position between public and private parties. Hierarchical intervention is to some advisable in order to prevent strategic behaviour of the market parties and to ensure major 'public risks' can be adequately managed.⁶⁰ Hierarchical intervention in the form of strict deadlines can also be fruitful for progress in the process of stakeholder involvement and coming to decisions for infrastructure interventions (see De Bruijn & ten Heuvelhof, 2008). Coordination and interaction between client, stakeholders and local infrastructure managers is essential given the consequences of the outcomes of intervention decision of one party for the performance of other parties. The 'degree of interaction and communication may be loosely, informally organized or formally at pre-determined interaction moments (i.e. every month a required top representatives meeting between contractor and fellow infra managers). The *degree of organizational fusion* is preferred to be independent, since managing a local network is only a part of the tasks the organizations carry out and therefore only requires a dedicated amount of resources to be spent.

Element 3: Degree of formality

Should the cooperation between the parties come to expression by means of an agreement? Given the interests involved and the importance of a high quality network for all parties, there should not be any doubt to answering this question: yes. The question that remains is: how formal should the agreement be arranged? That is, to what extent should the purpose (end result) of the arrangement and the responsibility and task divisions be laid down formally in a contract? In order to manage the network efficiently and in order to coordinate the tasks, it is important that each party is aware of its responsibilities (i.e. knows what can be expected from them). As we saw in chapter 4, a clear definition of responsibilities and tasks, explicitly agreed upon by each participating party is an important requirement for fruitful cooperation. This will also force parties to indicate their strengths at the begin stage of cooperation and prevent a damaged relation to come into existence (Klatter, 2015). Especially at the start of the cooperation, when parties need to get used to each other, more formal agreements are advisable. Also for the sake of creating an incentive to invest in the long lasting relationships, especially when there is need for stimulating innovation, more formal resource agreements are advised (Ackermans, 2015; Bus, 2015). Formal agreements are especially considered important in order to safeguard the performance levels agreed upon, to facilitate regular evaluation meetings and to ensure the flow of resources is continuously 'up and running'.

Element 4: Degree of flexibility and ownership

As has already been indicated in section 4.5, efficient asset replacement benefits from long-term contracts, with a flexible scope and end result, particular in introductory phases of the cooperation. The dynamic environment infrastructure objects are part of, require flexibility.

⁶⁰ Public risk is the expression for the risks the government is believed to manage best (i.e. the reason why Governments exist), such as managing flood risks (preventing a life-threatening flood risk from occurring).

Element 5: Responsibility division

From an asset management perspective, performance plays an important role in managing infrastructure networks. Hence, it is likely that performance is coupled to reward. A limited reward is considered hamper innovation. Here also applies: the reward structure should be agreed upon by all participants that financially contribute. At least for the private party the reward should be in line with the risk profile expected and should be sufficient to stimulate the private party to invest. The exact division between public and private parties will depend on the situation at hand. In order to let the private party make the ‘right’ intervention decisions based on knowledge from the network, it should receive equal decision power together with the other parties participating in the arrangement. Decisions are dependent and require therefore coordination in order to be aligned with the mutual interest. Figure 14 shows an overview of the preferred arrangement values. These values serve as a basis for the alternative formulation in the next section.

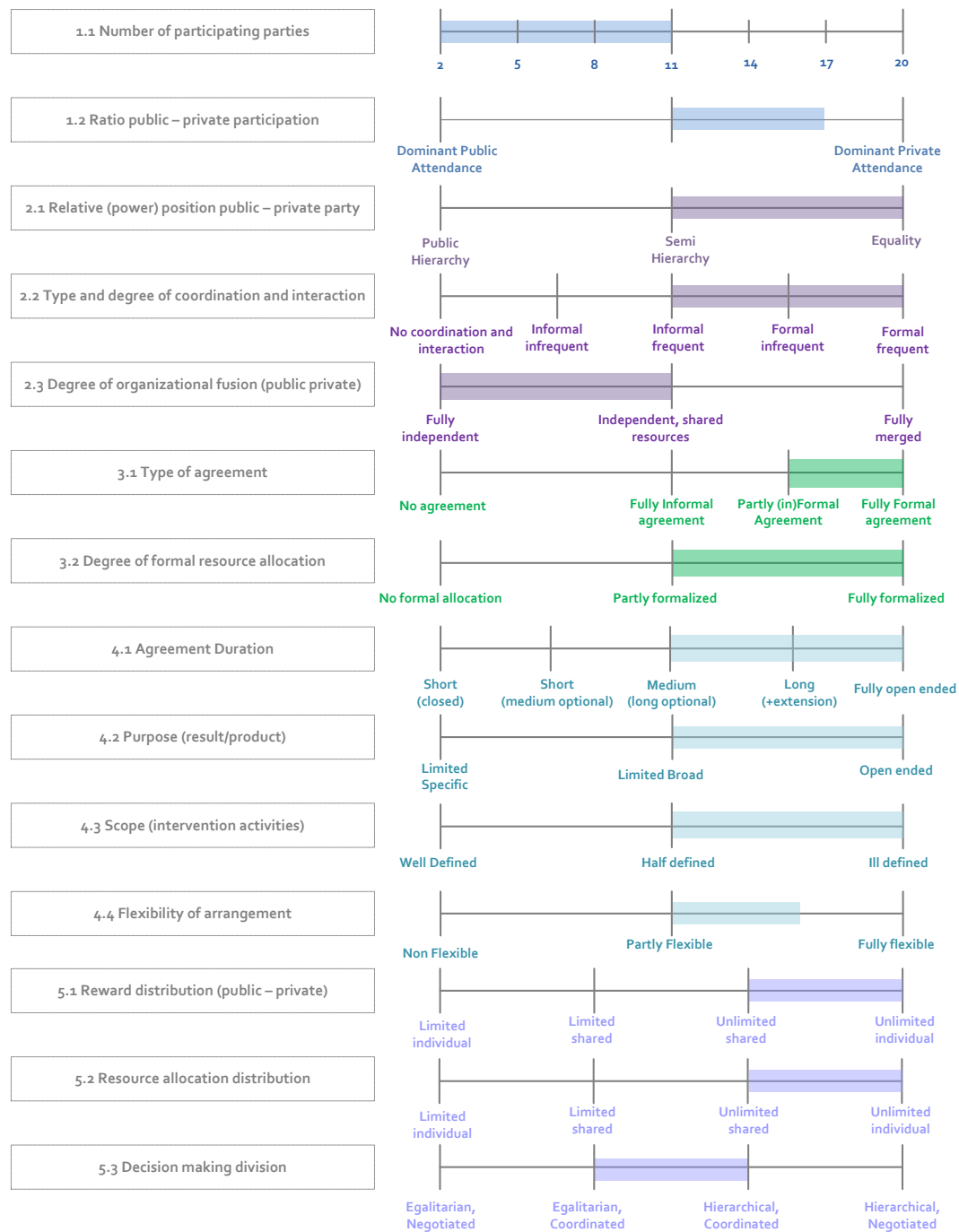


Figure 14 Demarcated arrangement values (hypothetical values) (developed by researcher)

5.3 Alternative description: task alternative arrangement combinations

This section describes the preliminary alternatives, which consist of the public-private task allocation as indicated in table 12, combined with ‘fitting’ arrangement values. These alternatives will be discussed during case study interviews and element values will be further specified.⁶¹

Alternative 1: Private Network Manager

This alternative consists of an arrangement between the public client (Rijkswaterstaat) and one contractor or several contractors. The client is responsible for most of the infrastructure management task, as the contractor(s) are responsible internal coordination tasks. This implies that the client will need to explore to what extent its performance goals can be aligned with those of the stakeholders and local infrastructure managers, hence the ‘freedom’ of the contractor(s) is limited with regard to the decisions that affect replacement, such as the formulation of the replacement strategy, design of the new objects and proposing an investment strategy. Because the synchronization responsibility is laid down at the client, the available budget leaves little room for negotiation. The public client will firstly balance its interests and needs with its ‘partners’ before it coordinates it with the market party. This means that the performance indicators the client formulates resemble the needs and interest of the stakeholders and local infrastructure managers. These performance indicators also include the acceptable risk levels. Furthermore, the client will evaluate the intervention decisions of the client together with the stakeholders and local infra managers. This arrangement still leaves ample room to the market party however, since it still has the freedom to determine the intervention activities, such as maintenance planning of the complete network, monitoring, formulating and executing a data collection strategy. Figure 15 provides a visual overview of this alternative.

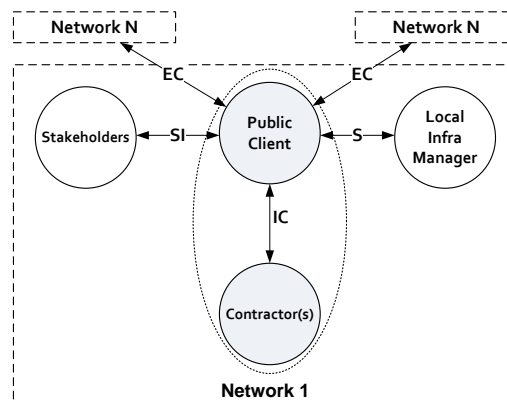


Figure 15 Visualisation of Alternative 1: Private Network Manager

Arrangement design

This task division has the following consequences for the arrangement element values. First of all the arrangement needs to be rather formal in order for the public client to ascertain the contractor will satisfy the needs of the stakeholders and local infra managers. Therefore, scope, agreement duration and end result will be clearly demarcated by the client, however providing the contractor with sufficient freedom to optimize long-term maintenance and develop innovative objects. A complete redesign of the network with regard to functionality, changing number of object is not likely to occur. Also formal coordination and interaction will be laid down to ensure to keep the contractor on track, which imply regular and frequent evaluation meetings to discuss performance of the client according to the performance goals. Meetings will also be held to ‘test’ intervention decisions the contractor proposes in order to determine whether these are aligned with the interest of the stakeholders and local infra managers. The

⁶¹ The arrangement element values that are ‘chosen’ for each alternative resemble a possible range, given the requirements for applying public private cooperation (chapter 3) and the replacement guidelines (section 4.4). Further specification means, that it is expected that during the case study interviews the preferences the respondents reveal, will lead to a smaller range of ‘effective’ element values. The case study *Stuwen Maas* will be examined to determine how these arrangements can be shaped, but above all which task allocation alternatives and arrangements will have the highest potential, that is: which arrangements are expected to perform well according to total costs, quality and innovation.

relative power position of the client is ‘semi-hierarchical’, which implies that the client will determine the rights, duties of the contractor unilaterally, though leaving room to the contractor to optimize the result of the arrangement in order to stimulate innovation. Input of resources are independently arranged, as are the resource allocation decisions in order to limit the risks the contractor will be confronted with in case the stakeholders and local infra managers require changes to the initial agreement. Allocation of resources will be formally arranged, which means that the contributions of both parties is ensured. Resource contribution is mostly ‘static’, however adoption is necessary in case external circumstances change and both client and contractor(s) agree to alter the contribution. The agreement duration is rather long (>30 years) in order to stimulate innovation. Possible cost savings will be coupled to performance of the contractor in order to stimulate innovation. Cost savings due to ‘lower’ stakeholder and local infra manager expectations will come at the benefit of the client. Extra costs due to ‘failure’ or under performance of the contractor will come at the cost of the contractor, so as to prevent strategic behaviour. Cost overruns due to ‘external’ factors and materialized risks as a result of innovations will be shared.⁶² An overview of the arrangement values is to be found in appendix 6.

Alternative 2: Private Network Director

In this ‘private network director’ alternative, the public client and one or more contractors form the ‘arrangement parties’. The contractor is responsible for needs identification of stakeholders and local infrastructure manager and is responsible for coordination of intervention activities with them. Prioritization of needs is therefore allocated at the contractor; the client keeps an eye on the contractor though. The contractor will be incentivized to act in the interest of the client. The contractor also has the incentive to do, since involving stakeholder needs may lead to more financing available. The private party steers the on network performance targets, which are aligned with the external network performance targets. The freedom of the contractor also comes with more responsibilities: it needs to prove that the intervention decisions are in line with the performance measures. The public client uses information of stakeholders and local infrastructure managers to evaluate the contractor’s performance. The contractor proposes intervention activities towards the stakeholders and local infrastructure managers regarding the replacement strategy. The contractor can decide himself which stakeholder and local infrastructure manager needs and wishes to incorporate in his decisions, however will have to justify its choices towards the public client. Since the contractor has the obligation to satisfy (or at least involve) the needs of stakeholders and fellow infra managers, the client need to evaluate to what extent the contractor is fulfilling this task properly.⁶³ The contractor is furthermore responsible for maintenance planning and execution, collection of asset data in accordance with the network performance goals and monitoring and evaluation asset performance. Identification and assessment of external factor is also done by the contractor. Figure 16 provides a visual overview of this alternative.

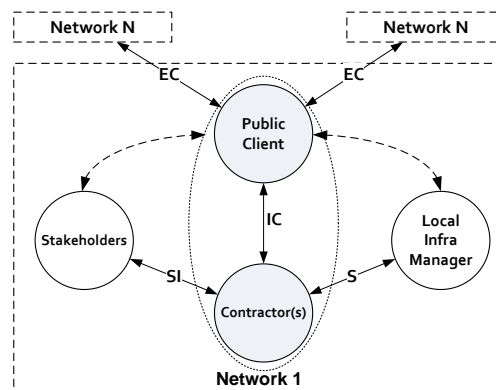


Figure 16 Visualised overview of alternative: private network director

⁶² A condition for the sharing of these costs is that the client has agreed upon the development and implementation of this client and the contractor did not fail the client in the provision of all relevant information.

⁶³ Strictly speaking evaluation by the client will not be necessary, however it is expected that the rent seeking behaviour of the contractor may lead to suboptimal prioritizing of stakeholder needs.

Arrangement design

This arrangement will be rather informally arranged: the contractor has the freedom to determine its own interventions, as long as the network performance agreements are met. Mutual agreement has to be found on the performance measures the contractor has to achieve. The agreement is open from the beginning on: the contractor will determine the end result based on interaction with stakeholders and local infra managers. Agreement duration is at least 30 years, with several options for extension, since this will allow the contractor to make long-term choices and the freedom to optimize the system, and also provides several opportunities to earn back its innovation investments. This will require more flexible contractual and performance agreements, as a consequence of the unknown influence of external factors. Coordination will be less formalized, though interaction will be more formally arranged: the feedback moments with the client. The client provides financial support as long as the client does it work properly, that is, as long as it achieves its performance targets, of which the 'right' prioritization of stakeholder needs is one indicator. Hence it is prevented the contractor will benefit from 'cheap' solutions. Innovation is stimulated by sharing of cost savings and sharing of cost overruns. Allocation of resources is partly formally arranged, such that much is left to 'fill in' at the start of the agreement. An overview of the arrangement values is to be found in appendix 6.

Alternative 3: Network Alliance

In this alternative Rijkswaterstaat, stakeholders, local infra manager(s) and contractor(s) are all part of the arrangement. They jointly manage the complete network, they have financial stakes in the network and they jointly manage the risks involved. Performance targets for the network and contractor are also jointly formulated. This means intense coordination of both decisions and decision making activities. One or more contractors can be part of the arrangement. The contractor is part of the alliance and will have to propose its plans to all partners, which have to agree on these plans. This includes plans for replacement moment, redesign of the network and design of the new objects. All needs and wishes can be identified from the beginning on. Evaluation can directly take place: face to face. The scope is very open at the start as is the result. Over time the scope and result will develop towards more detailed plans. The internal coordination responsibility will however be lie at the contractor, which means that the contractor has the lead in determining maintenance plans. Data collection, asset monitoring and external factor impact assessment will be executed by the contractor, however should receive approval from the 'alliance partners'. Risks and rewards will be shared together. This alternative is visualized in figure 17.

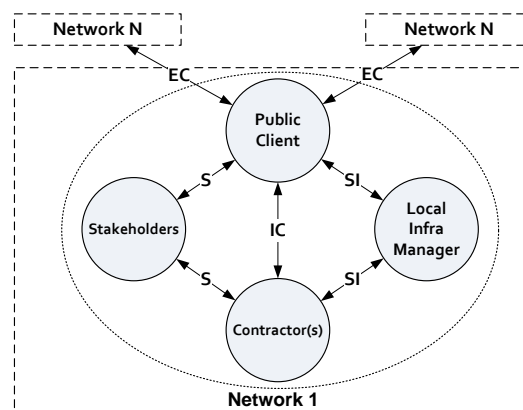


Figure 17 Visualisation of alternative 3: network alliance

Arrangement design

This alternative is characterised by equality and flexibility and informality. All parties bear joint responsibility with regard to result, scope, investments and profits, if any, and decision making. Parties agree formally on the amount of resources they are willing to spend on the project, however the real allocation will be determined during the cooperation. All parties have equal decision power with regard to allocation of the joint budget. The agreement duration is open ended. Scope and purpose are generally formulated at the beginning of the cooperation in order to

have a starting point for discussion. Scope and purpose are hence determined along the way, however being as flexible as possible. Full flexibility is not feasible, since this is expected to hamper the willingness to invest and will hamper innovation. This requires an informal agreement, almost 'blank' at the start. Interaction and coordination will be mostly informally shaped, in accordance with the interaction needs of the parties. However, regular formal meetings to evaluate performance, activities and to 'look ahead' will take place. Cost savings will be divided in proportion to the investments a party has made.

6. Case Stuwen Maas

What public-private arrangements and public – private task allocations are suitable for strategic replacement of infrastructure assets? After having gained theoretical insights and a general context description of replacement in the Netherlands, it is time to test which task allocation format is considered suitable for Case Stuwen Maas and which arrangements are to be designed accordingly. This chapter starts with a description of the case study context, including the replacement context and decisions to be made. Next, public-private task allocation and arrangements are formulated for the replacement of seven Maas barrages, based on six structured interviews. This chapter ends with a concluding section.

6.1 Case Study Description: the context of replacing the Maas Barrages

During the twenties and the thirties of the 20th century, seven barrages have been built in de Maas River (figure 18). These barrages were designed for a technical lifetime of 80-100 years, mainly for the purpose to improve the navigability of the important trade route the Maas River is part of (Rijkswaterstaat, 2010). Since then almost a century has passed. Since the construction of the barrages much has changed. Inland shipping transport has increased, which lead to intensified usage of the barrages and sluices. Climate change has led to both increased need for regulating and maintaining water levels: higher water levels and longer periods of drought. The barrages and their main function of the barrages became more important over time. The replacement moment lies in wait. Table 12 shows the characteristics of the seven barges.

Table 12 Overview Characteristics Maas Barrages

Barge	Year of construction	Main function(s)	Planned replacement ⁶⁴	Replacement value ⁶⁵	Detailed information
Borgharen	1928	Maintaining and regulating water levels	2025 – 2030	€52,2 billion	Can be ‘opened’ during flood
Linne	1921	Maintaining and regulating water levels	2035 - 2040	€53,7 billion	Cannot be opened for ships, power generation function
Roermond	1921	Maintaining and regulating water levels	2030 - 2035	€50,1 billion	National monument, combined with sluice, can be opened during flood
Belfeld	1924	Maintaining and regulating water levels	2030-2035	€50,6 billion	Combined with sluice, can be opened during flood
Sambeek	1925	Maintaining and regulating water levels	2030-2035	€50,3 billion	Combined with sluice, can be opened during flood
Grave	1926	Maintaining and regulating water levels	2030-2035	€67,3 billion	Can be opened during flood
Lith	1936	Maintaining and regulating water levels	2035-2040	€75,9 billion	Can be opened during flood, power generation function

Note. This table is based on based on de Jong (2014) and van Tilburg (2015).

Over their lifetime the barrages have taken an essential role in the systems they are part of. The water regulation function of the barrages is of great importance for the Maas Region, as it influences water levels of adjacent water systems, ensures sufficient draft for inland ships and protects the local area against water floods. As a result of their long lifetime, the barrages have taken a dominant position in the system and influence adjacent systems, i.e. their ‘environment’ and adjacent systems have been formed and developed while the barrages were in place. The barrages are multifunctional (see table 13). As a consequence the replacement of the barrage touches the interests of a wide variety of parties. First of all the ‘local’ stakeholders: municipalities, water boards and provinces, and citizens. Given the importance of the Maas as (trans)national trade route, the national government, embodied by the Ministry of Infrastructure and the Environment, and the European Union also have much at

⁶⁴ Corresponds with the end of lifetime.

⁶⁵ Earlier estimates of the replacement value of Belfeld, Linne, Grave, Roermond and Borgharen barrages respectively reported Bn€154,5; Bn€181,2; Bn€, 101,1; Bn€154,5; €163,1 (Rijkswaterstaat, 2011).

stake.⁶⁶ Given the ecological function of the barrages, nature interests groups will have their say in the replacement specifications. The replacement of the barrages will also influence adjacent ship routes and networks as being bypass routes. Replacement will inevitably come along with hindrance and disturbances. Therefore, national inland shipping interest group, such as Schuttevaert, will be an important stakeholder. As indicated earlier, the variety of involved interests also provide opportunities for gaining additional support, the so called replacement opportunities. Some interests might be conflicting. Citizens will mainly care about local employment rates and the recreational and cultural value of the barrages, while Rijkswaterstaat is mainly concerned with providing a high quality trade route, with high draught and throughput capacity. The combination of ‘heavy’ inland shipping may interfere with the need of safe and pleasant recreational shipping. An overview of all relevant functions can be found in table 13.

Table 13 Current Functions of the Maas Barrages.

Main Function	Secondary functions	Consequences for wishes and requirements for replacement
Regulate water level (water throughput and discharge)	Regulation of local water levels (and those of adjacent systems)	Consider Maas barrages as part of an integrated system
	Flood protection	Sufficient throughput capacity in case of flood
	Manage water shortage	
	Provide sufficient draught for barges	Anticipate modal shift to inland shipping, stimulate growth and competitiveness of regional ports and economic area's (mainports)
Stimulate Ecological development	Facilitate fish migration	Sufficient throughput capacity
	Facilitate Network of protected areas	Robust and resilient system, connect nature and water system
Provide inland shipping transport	Facilitate smooth passages of barges and ships	Minimize obstacles and hindrance (maximize smooth passages)
	Facilitate ‘river-crossing’ road transport	Regulation with local infra managers
	Facilitate Safe transport	Possible separation of commercial and recreational shipping
Create and maintain cultural and recreational value	Facilitate network connections cycle paths and trails	Provides room for replacement opportunities
	Facilitate pleasant recreational shipping	n.a
Safeguard water quality	Safeguard surface water quality	n.a
	Regulate local water levels	n.a
Generate power	n.a	Barrages as ‘sustainable’ objects

Note. This table is based on van Tilburg (2015)

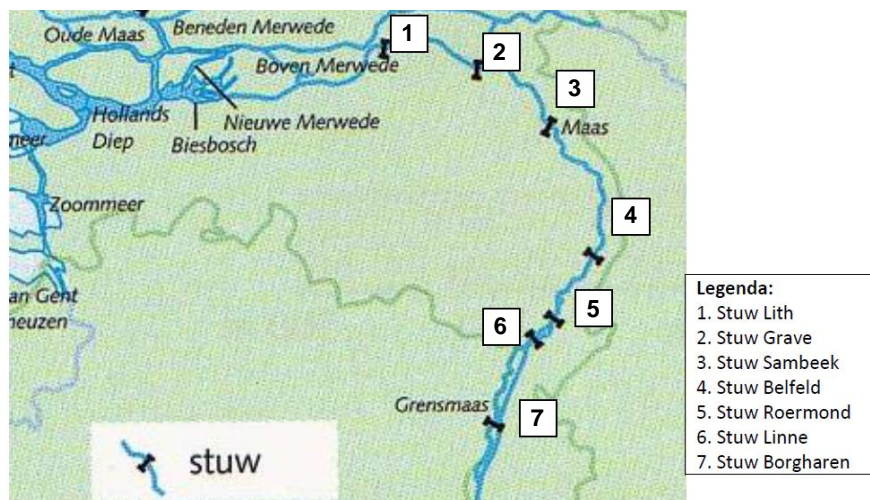


Figure 18 Geographical Locations of Maas Barrages (adapted from van Tilburg, 2015:4)

⁶⁶ The financial contribution of the European Union to the Maaswerken project’ proves the European interest.

6.2 Identification of replacement decisions

Given that the end of lifetime of the seven barrages falls within the same timeframe, the opportunity rises to ‘redesign’ the entire Maas network with regard to its functionality. As we have seen in the introduction the replacement process starts with answering the question: what do we want the Maas network to achieve?⁶⁷ That is: what functions and according performance targets to prefer? In the past few years several studies have been executed to explore and discover the opportunities for ‘redesign’, which were formulated as so called network alternatives.⁶⁸ Each network alternative has its own focus, which is a dominant function on which the network design is based. Some alternatives focused on the flood protection function of the Maas. Others, consider the Maas as a ‘catalyst’ for the development of and upgrading of local mainports (for instance Venlo) to (inter)national mainports or consider the Maas as a ‘field’ for alternative (green) power generation (DHV, 2010).⁶⁹

This process of network alternative development and selection will take considerable time and can be considered strategic in itself. Choosing one alternatives over others implies preferring several functions, which means that the interest of a limited set of stakeholders will be preferred over others. Furthermore, the selection of criteria to use for evaluation of alternatives will have large consequences on the functioning of network in the decades to come. Finally, in order to rank the alternatives assumptions about future development of external factors will be made: which scenario’s to take into account? It is likely that the choice for a network alternative will be irreversible; a lock-in situation is not unlikely to occur.⁷⁰ This first phase in the replacement process will to a large extent determine the stakeholder support for subsequent phases. As such, the financial support for the complete replacement project will be determined at the end of this phase, and therefore the more a reason to pay significant attention to this phase.

When the network alternative is chosen, the real ‘designing’ of the replacement can start by developing a so called replacement strategy. All activities undertaken to achieve the future situation from the as-is situation are part of the replacement strategy. The replacement strategy regarding the replacement of the Maas Barrages involves making three decisions. First, the ‘role’ and functioning of objects need to be determined. That is, what ‘kind’ of assets are required, what should their performance and functions be, how many assets should be placed? This includes the design and construction of the new assets. Second, this new situation should be compared to the current situation: what does it imply for the barrages? Decisions need to be made as to what to do: renovation or replacement? Third, the management activities that is necessary to execute to arrive at the future situation need to be determined. This includes determining how to maintain the current barrages, deciding when to replace and deciding the replacement sequence. From the perspective of the public financier an equal spreading of expenses is most ‘ideal’. Using the replacement opportunities⁷¹ also requires a ‘fine-tuned’ approach, which may differ per barrage. Once again it can be stated: there is no single best replacement moment or ‘optimal’ replacement strategy.

6.3 Description of replacement roles for replacing the Maas Barrages

When considering the strategic replacement decisions including the replacement strategy in the light of public-private arrangements, the question remains whether the public client or private contractors should be responsible for making these decisions. Closely connected with these decisions is the division of replacement tasks. As a prelude to answering these questions, the four replacement roles that were identified and explained in section 4.5.1 will be applied to this case. As such, they form the basis for investigating the public-private role division for replacement of the Maas barrages.

⁶⁷ Of course it is also possible to replace ‘one-on-one’, whereby for each barge the functionality may change, but this change will be rather limited. When opting for a more innovative alternative, that is ‘redesign’ of the Maas network, one have to keep in mind that this might take a while, for a variety of studies will have to be executed, new functionality will have be ‘negotiated’ with stakeholders etc. It will be interesting to investigate and design this process from a process management perspective.

⁶⁸ In Dutch: arealvarianten.

⁶⁹ For a detailed description and explanation see DHV (2010).

⁷⁰ It will take considerable time before all infrastructure planning procedures in the Netherlands will be dealt with. Given the importance of the ‘well-functioning’ of the barrages for water protection and inland shipping transport, action will need to be taken before the final lifetime arrives in order to prevent the barrages to fail.

⁷¹ In Dutch: meekoppelkansen.

Internal coordination

Internal coordination incorporates all internal intervention activities that contribute to the network performance. The network performance that is established for network Maas will form the basis for deciding upon what intervention activities to execute. As such, this role includes the development of the replacement strategy, which in turn includes the design of the new assets, determining the replacement moment and sequence, and deciding upon the maintenance concepts and maintenance plans to use. Next to this, data collection, monitoring and evaluation of current performance of the barrages and the complete network are part of this task, as is the identification of external factors and their impacts.

External coordination

External coordination mainly implies determining the required network performance for the Maas network, based on performance with other networks. Performance of other, adjacent networks, such as channels, and other rivers (such as the Rhine River and Waal River) might influence the performance of the Maas network. External coordination furthermore entails interface management of the Barrages with other assets, such as sluices in neighbouring networks. Coordination with other networks during replacement, such as ensuring continuity of inland shipping is also part of this role.

Stakeholder involvement

This task mainly consists of the identification and prioritization of stakeholder needs and identification of their willingness to (financially) contribute to the replacement process and solutions. The stakeholders include the managers of infrastructure that is influenced by the performance of the Maas network, but are not under the supervision of Rijkswaterstaat. Local water boards for example belong to this category. Stakeholders will be involved in several decisions, such as the future design of the network, determining of replacement sequence, design of new objects, but also the design of maintenance plans.

Synchronization

Synchronization mainly relates to the coordination of activities with local infrastructure managers that manage elements of the barrages. Synchronization is necessary for maintenance of the barrages. Local infrastructure managers will be important for determining the design of the new objects, since this will influence their management activities significantly, especially if maintainability of the new objects is addressed for during the design phase.

The ‘design’ of the network alternative (future network design) is not limited to one role. All four roles contribute, though each role in its own way. The internal coordination role focusses on the replacement strategy: design of new objects, maintenance concepts. Also data with regard to development and impact of external factors is part of internal coordination. The party responsible for external coordination focuses on aligning of network performance with other neighbouring networks and national infrastructure policy. Stakeholder involvement implies identifying ‘future stakeholder needs’, prioritization, and gaining (financial) support. Incorporating local infra manager needs and coordination of activities forms the input of the party responsible for synchronization. The question remains: which role should be executed by the public client and which role by private parties? The role division will determine who will make the replacement decisions as described above. In order to determine an efficient public – private task allocation six case study interviews were held.⁷² These interviews were also used for the design of arrangements. The remaining part of this chapter presents the results of these case study interviews.

⁷² More information on the case study selection and respondent selection can be found in section 2.5. The interview protocol used are to be found in appendix 3. Appendix 7 provides a detailed overview of the respondent’s preferences for the public-private allocation of tasks. Appendix 8 provides data concerning the evaluation of the preliminary task alternatives, and Appendix 9 provides the choice data concerning the element values and Appendix 10 shows an overview of public and private involvement in the replacement tasks.

6.4 Finding a suitable public-private task division for replacing the Maas Barrages

This section describes the results of the public-private task division as indicated in the case study interviews. Both ‘public and private respondents’ were asked to indicate for each replacement task their preference: public or private allocation.⁷³ The results of the case study interviews show diversity among the preferred task division between public and private parties. Only three out of eighteen tasks show similarity in allocation preferences, of which *measuring network and object performance* (IC2) is the only tasks that the respondent unanimously agreed upon. Despite the divergent preferences, a clear pattern is visible: a clear preference for private allocation of operational tasks, a preference for ‘essential’ public tasks, but above all a preference for joint execution of tasks under the responsibility and supervision of either client or contractor.⁷⁴

Public and private tasks: a distinction between operational and strategic tasks

In general, preferences for the allocation of strategic tasks are preferred to be allocated to the public client, while operational tasks are allocated to market parties.⁷⁵ Three reasons are mentioned for this. First, the operational tasks, such as maintenance, collection of data, measuring performance resemble the core business of market parties. Hence, market parties possess the relevant knowledge and expertise and are expected to execute ‘technology based tasks’ more efficient than Rijkswaterstaat, as a result from competition (de Jong, 2015). Second, separation of strategic and operational tasks is considered to ensure a ‘checks and balances mechanism’. Letting market parties execute the measurement of network and object performance above all guarantees the legitimacy of the public client: goal and performance setting should be executed independently in order to safeguard objectivity of Rijkswaterstaat as infrastructure manager with regard to the achievement of network performance goals (Waltje, 2015; van Hengel, 2015). For the same reason de Jong (2015) advises to separate maintenance evaluation from planning and execution. Third, some tasks are so essential for network management that they are only considered to be ‘safely’ executed by the public client, that is these tasks are of ‘social importance’ (Michon, 2015, Waltje, 2015). This is the case with *formulation of long-term network performance targets* (EC1) and *formulation of performance goals and targets* (IC1) tasks. Market parties can play an assisting and advisory role, though end responsibility and decision making power should be in public hands (van Vuren, 2015). Led by rent-seeking behaviour, market parties are not considered to be able to set realistic, non-discriminatory performance measures (van Hengel, 2015). Besides, the requirement to accommodate network performance with legal frameworks is a reason for public allocation (de Jong, 2015). Furthermore, Rijkswaterstaat is only equipped to coordinate performances among networks; no single market has the resources to bear this responsibility (de Jong, 2015). The same line of reasoning applies to *formulation of acceptable risk levels* (IC7).

The added value of public-private cooperation: a hybrid task division

Most of the task are considered to be best allocated when both parties are equal partners and cooperate from the beginning of the replacement process.⁷⁶ Interestingly, these ‘cooperation tasks’ relate directly to replacement, such as determining investment budgets and replacement moment and strategy. The idea behind this joint approach is that by fitting together the knowledge of public client and contractors the best result is obtained. Over the years Rijkswaterstaat has gained much ‘system knowledge’ including asset information, which is inevitable for formulation of a replacement strategy, while market parties possess technical, design and construction expertise (de Jong, 2015; van Vuren, 2015). “*The knowledge of market parties smoothly merges the knowledge of the government*” (Albrecht, 2015). Private parties are able to determine and gather the investment budget on their own, under the condition that the client provides the relevant system information, that is the current state of the network and the assets (de Jong, 2015). As van Vuren (2015) points out: “*If you start a joint initiative then you have to determine the investments together*”⁷⁸ The same applies to planning and executing maintenance. The joint approach also works for the *formulation of acceptable risk levels* (IC7) where the private party takes the technical risks on its account, while the client is responsible for the legislative and administrative risks according to de Jong (2015). Albrecht (2015) advises to let the end

⁷³ In this chapter public respondents will be indicated by ‘public client’, private respondents will be indicated by ‘contractors’.

⁷⁴ An overview of public-private task preferences is given in Appendix 6.

⁷⁵ Strategic tasks concern network ‘overarching’ tasks (external coordination), long-term focused. But also stakeholder involvement.

⁷⁶ Appendix 8 provides an overview of public – private task allocation preferences.

⁷⁷ Original quote: “*De kennis van de markt loopt mooi over in de kennis van de overheid.*”

⁷⁸ Original quote (in Dutch): “*Als je er samen ingaat in zo’n traject, dan moet je daar samen in investeren.*”

responsibility of this tasks in public hands but recognizes the importance of joint identification and allocation of risks, the ‘small-chance-big-impact-risks’⁷⁹ in particular in order to create mutual trust and stimulate market parties to show initiative in discussing risk allocation and preventing risks to occur. Lastly, the joint approach is advised for the *identification of external factors and impact assessment* (IC6), where contractors take responsibility for the development of the technical factors and the client bear responsibility for the cyclical (external) factors (de Jong, 2015). Respondents consider the identification of stakeholder requirements and stakeholder communication a private task, while the final decision on whether to incorporate these needs or not is above all considered a public responsibility. However, this preference need to be taken with a degree of caution as was indicated by van Vuren (2015): *I am very curious whether in case one decides to place this task completely in private hands, one obtains the same result as if the government had done it.*⁸⁰ An overview of the public-private task allocation as indicated by the respondents is provided by table 14.

6.5 Implications of public-private task allocation for governance and project outcomes

The central idea behind an optimal public – private task allocation is that it leads to improved project outcomes, in terms of costs, network quality and successful realized innovations. The realization of this potential will not only result from simply allocation these tasks. In this section it is argued that governance mechanisms play an important role in this.

Public-private cooperation with regard to infrastructure replacement is in general considered to be of added value in terms of costs, network performance and stimulation of the potential for innovation, and as such has much potential. However, the downsides should not be neglected. Especially the tasks that are at the interface (border) between public and private responsibility require further attention. The biggest fear from the client is that market parties will place their own interest first, that is rent-seeking behaviour, which clashes with the client’s aim to maximize network performance for the user while satisfying budget constraints. The downside of market involvement is a lower quality level (van Vuren, 2015; Waltje, 2015). Profit is considered to be the main driver of contractors. As a result will aim to optimize the fulfilment of stakeholder requirements at the minimal required level. This approach might bring innovative and efficient solutions, however will lead to a lower quality.⁸¹

Apart from the public-private task allocation design, adequate performance steering stays an essential element of public-private cooperation. The client needs to formulate performance indicators such that the contractor is incentivized to deliver that performance which in turn leads to ‘better’ performance than the client could have reached alone.⁸² Performance management is considered as the most suitable governing principle for public-private cooperation, especially if the performance goals are formulated as ‘abstract’ goals (Albrecht, 2015), since they give the contractor the freedom to innovate and opportunities for cost reduction and achieving a higher network quality.⁸³ The opposite effect is also indicated: in case of detailed formulation of performance goals, the outcome will be predictable, however is also more costly since there is little room for innovation (Albrecht, 2015; de Jong, 2015) and competition (van Hengel, 2015; Waltje, 2015). Michon (2015) describes the process of formulating performance targets as a ‘struggle’, mainly as a result of the interdependencies of assets with regard to their performance and requires the client to have full understanding of the impact of performance measures on system performance.⁸⁴ He is not alone in this; van Hengel (2015) describes it as ‘difficult’ and explicitly states the need for a competent client that is on an equal footing with its private counterpart, such that the performance criteria are reasonable, understandable and quantifiable. From a market perspective the performance measures should create sufficient room

⁷⁹ In Dutch: kleine-kans-groot-gevolg risico.

⁸⁰ Original quote (in Dutch): “Ik ben dus wel benieuwd van, stel je legt dat helemaal in handen bij de private partij, of je dan dezelfde uitkomst hebt als dat je het in handen zou leggen van de overheid.”

⁸¹ Compared to a execution of this task by the client. In theory market parties can obtain a similar quality level, in practice it is difficult.

⁸² Albrecht (2015) calls this professional commissioning (in Dutch: professioneel opdrachtgeverschap), van Hengel (2015) mentions it an essential public competence.

⁸³ Waltje (2015) is very optimistic about innovation: “if you give market parties as much tasks as possible, innovation will emerge whatsoever.” Original quote (in Dutch): “Als je maar zoveel mogelijk bij de marktpartijen neerlegt dan komt innovatie vanzelf wel.” The ‘exact’ effects of performance steering has everything to do with the arrangement that will be used (de Jong, 2015; van Vuren, 2015). All respondents have indicated this relation between task allocation and the subsequent arrangement.

⁸⁴ Example: if you define the maximum acceptable ‘loss of travel time’ over a collection of 3 sluices, say 2 hours. The decomposition to the performance level of one sluice is then problematic, since it is dependent on the performance of the other two sluices (Michon, 2015).

for the contractor to intervene, in this case for example the design of the replacement strategy (de Jong, 2015). An exception to this rule are stricter goals with regard to performance coordination with other systems (ibid) and standardization of the barrages, such as control systems (Michon, 2015). Also the control processes need to be detailed specified in order to prevent disasters to occur (Albrecht, 2015). The formulation of clear and ‘fair’ targets is difficult, since isolation of asset and network performance can be problematic due to the interaction of asset performance. This may lead to difficulties with stimulating right ‘behaviour’ of contractors and problems concerning objective evaluation of project performance. As such it forms a threat to a ‘good’ client-contractor trust relationship.

Table 14 Overview of task allocation according to respondents

Task	ID	Public	Private	Private (Public)	Public (Private)	Public / Private	Public & Private
Formulation of performance goals and targets	IC1	1,3	2		4,5,6		
Measuring network and object performance	IC2		1,2,3,4,5,6				
Determining and deciding on investment budget	IC3		2		3,4		5,6
Identification, planning and evaluation of maintenance	IC4		2,3,4,6	1			5
Determining replacement moment and replacement strategy including design	IC5		2	1	3,4		6
Identification of external factors and impact assessment	IC6	3	2,4		6		5
Formulation of acceptable risk levels including integration with decision making	IC7	2,3			4,6		5
Design of data collection process	IC8		2,3,4		6	5	
Formulation of long-term inter network performance targets	EC1	3,5			4,6		
Formulation of long-term inter network investment needs	EC2	3			4		5,6
Identification of inter network external factors and impact assessment	EC3	3			4,6		5
Translation of long-term inter-network performance goals to network specific goals	EC4	5	3,4,6				
Formulation of inter network data collection strategy	EC5		3,4,5		6		
Long-term internet work capacity planning	EC6	3	5		4		6
Integration of asset data to inter network level	EC7	3	4,5		6		
Identifying stakeholder requirements including prioritization	SI1				2,3,4,5	6	
Identifying local infrastructure manager requirements	S1	4	2,3		5		6
Coordination of management activities with local infrastructure manager	S2	4	2,3		5		6

Note. 1 = Michon (Rijkswaterstaat); 2 = van Hengel (Rijkswaterstaat); 3 = Waltje (Antea Group); 4 = Albrecht (Rijkswaterstaat); 5 = de Jong (Heijmans); 6 = van Vuren (HKV Consultants / TU Delft); Public = Public responsibility; Private = private responsibility; Private (public) = Private responsibility with public assistance; Public (Private) = public responsibility with private assistance; Public / Private = no preference, both parties can bear responsibility; Public & Private = joint responsibility.

Given the complexity of the replacement of the Maas Barrages, strict performance formulation by the client will be very difficult to achieve (de Jong, 2015). The project is better served by joint development of performance targets and project goals, especially when client and contractors work together from the start of the project. Early interaction will also create commitment for performance goals, which create stability and also an incentive to cooperate (Albrecht, 2015). The ‘system knowledge’ of the contractor combined with the technological knowledge of the contractor(s) will lead to an improved identification and allocation of risks and will save costs since unnecessary risk premiums are prevented (de Jong, 2015). Besides, the contractor can also force the client to think outside the box (van Vuren, 2015). This “out-of-the-box-thinking” is required to stimulate innovation, otherwise the client will evaluate the solutions based on its own knowledge which will not ‘correctly address the added value of innovation’ (de Jong, 2015). Innovation can play an important role in replacing the Maas Barrages, since innovation is expected to lead to lower costs and higher quality solutions (van Hengel, 2015).⁸⁵ With regard to the close cooperation with stakeholders and local infra managers, opinions are diverse. Involving a ‘large’ group of stakeholders may lead to long decision making processes, which will increase costs. Due to the variety of interests innovation might be hampered (Waltje, 2015). The opposite effect may also take place: the negotiation process in which each actor will strive for ‘best value’ might stimulate innovation and lower cost as it is expected the process will create more mutual understanding and the probability of consensus will be higher (van Hengel, 2015) and all parties will try to find the optimal solution that is aligned with the common interest by means of challenging each other, which will lead to lower costs and more innovation (de Jong, 2015).⁸⁶

6.6 Composing arrangements for replacement of the Maas Barrages

All respondents have composed arrangements which they consider the most suitable for replacing the Maas barrages. This section presents the results and implications of the arrangement values. Figure 19 (page 56) provides an overview of all ‘chosen’ element values. A close inspection of the arrangement value preferences show several ‘patterns’, which will be discussed in this section.

The client contract contractor relationship: moving towards cooperation

The need for cooperation comes into expression in several preferences. First, in a nearly equal contractor – client relationship. Equality is considered beneficial for three reasons. First, equality is an absolute necessity for cooperation, which leads to a higher network quality (van Hengel, 2015). Second, it is required to foster mutual learning and transfer of knowledge, especially in the beginning of the project (Michon, 2015). Third, equality is key to jointly define the purpose and scope of the agreement and to shaping the replacement process and cooperation (Albrecht, 2015). A second expression of cooperation is the strong preference for coordination and interaction during all phases of the project. At the very beginning, coordination and interaction contributes to proper risk identification, a clear division of tasks and responsibilities and identification of each other competences (Michon, 2015). During the execution of the project itself, coordination and interaction stimulate both client and contractor to stay on track, to evaluate performance, to stay in touch (“*it is good to look each other in the eye*”⁸⁷) and to adjust or sharpen the responsibility and task division (Michon, 2015). “*One can only build cooperation and confidence when you see each other often.*”⁸⁸ Informal interaction and coordination is preferred, because it is ‘faster’ and more effective than formal interaction and should therefore be used when possible (de Jong, 2015; Waltje, 2015). The third expression of cooperation can be found in the limited number of contractors to be involved by both client and contractor. Involving only one contractor prevents potential conflicts about responsibility division between contractors.⁸⁹ These conflicts can be prevented by means of clear demarcation rules, however will quickly lead to diminishing of the

⁸⁵ Innovation does not necessarily have to lead to lower costs and higher quality, the opposite may also occur, if innovation goes wrong.

⁸⁶ This requires all parties to bear financial risks, i.e. all participants must be willing to pay for ‘the realization of their need’ (de Jong, 2015).

⁸⁷ Original quote (in Dutch): “Het is goed om elkaar goed in de ogen te kijken.”

⁸⁸ Original quote (in Dutch): “Je kunt alleen maar samenwerking en vertrouwen opbouwen wanneer je elkaar vaak ziet.”

⁸⁹ In Dutch: “welles-nietes=spelletjes” Next to the positive expected effects of single contractor involvement, also the downsides were mentioned. Outsourcing the management of the complete Stuwten Maas network to one contractor is not feasible (or at least not at the moment). The project is too large to be ‘manageable’ by one contractor and market parties are not able to bear the financial risks involved in the replacement of all barrages (Albrecht, 2015; de Jong, 2015). Involving two or three contractors is considered more realistic.

advantage of public-private cooperation: high quality, cost efficient and innovative solutions (van Hengel, 2015). Besides, communication is much easier when one contractor is involved (Waltje, 2015). A “one-on-one relation”⁹⁰ is also considered highly advantageous for the contractor, since its responsibilities are clear and ‘coordination efforts’ are saved (Waltje, 2015). A fourth expression of cooperation follows from the need to coordinate essential intervention decisions, such as the adoption of the investment budget and deciding on the replacement strategy. The last ‘indication’ of cooperation becomes visible at the sharing of costs and cost savings (rewards). Equal division of rewards and costs will stimulate innovation (de Jong, 2015), however also implies the client will pay extra costs if necessary (Albrecht, 2015).

Despite the advantages of cooperation, cooperation also has downsides. Real cooperation based on full integration of client and contractor, which is based on equal decision making power regards allocation of all organizational resources, is however not deemed possible due to the ‘essential different reasons for existence between client and contractor. Rather, completely independent organisations and independent entities with the allocation of a common resource ‘budget’ where both parties have decision authority are considered more effective. The proponents of independent organisations argue that they simply do not want the other party to decide about their resources, since it is not necessary to reach the goals of the cooperation (van Vuren, 2015). On the other hand, proponents of shared resources indicate that it improves innovation and decreases costs (Albrecht, 2015). “*If you work together, you have to sit around and need to use each other’s resources*” (van Hengel, 2015).⁹¹ De Jong (2015) prefers sharing resources until the execution phase of the project. A second concern of cooperation relates to strategic behaviour of the contractor. The client fears that in case all network activities including replacement are given to one contractor the price will be higher and innovation will be hampered; several contractors need to be involved to stimulate low prices (Michon, 2015; Albrecht, 2015). The third critical remark to cooperation states that cooperation is not always considered to be effective. A dominant client is required to evaluate contractor performance and to intervene if necessary (Michon, 2015). “*Only one party can be the boss. That is always the best thing to do, otherwise discussion prevails.*”⁹² The public client will in the end pay for the solution provided, so it is clear the client should maintain a dominant position (de Jong, 2015; van Vuren, 2015). This ‘public dominance’ is foremost preferred as it comes to bearing the end responsibility of fundamental decisions. This is not to say the contractors may not have a say in this. Consensus exists about private involvement for assisting in provision of decision making information, such as provision of technical analysis (Albrecht, 2015; van Vuren, 2015). Decision making division should be linked to the risk allocation (de Jong, 2015), which will give the client more authority, though near equality can be achieved. Fourth, the contractor should be incentivized to save costs and therefore have a share in the distribution of cost savings (Albrecht, 2015). However, much of the investments will be done by the client, so also the client should also benefit from savings (Albrecht, 2015; Michon, 2015). Discussion exists about whether to divide the reward and costs equally or not. The division of rewards should be coupled to the investments made. Rewards and extra costs need to be divided equally and performance based (Waltje, 2015). Reward and cost division should be coupled to the initial responsibilities and agreements made: “*As a client you do not want to suffer from the faults of the contractor*” (van Vuren, 2015).⁹³ The same goes for rewards: when a contractor realizes cost savings he should be rewarded (ibid).

The need for long-term and flexible arrangements

The uncertainty involved in infrastructure replacement as a result of the long-term focus is resembled in the element preferences. First of all it urges the need for flexibility, which comes to expression in a flexible agreement duration, flexible scope and flexible end result. Despite the need for flexibility a clear need for contracts with a time duration of 30 years or longer if prevailed.⁹⁴ First, efficient replacement requires the contractors to get to know the network

⁹⁰ This means that one contractor is responsible. The contractor is ‘free’ to hire other contractors on its behalf. Doing so may even be advantageous for the ‘quality’ (network performance), since it enables the availability of multiple disciplines that are necessary in managing assets (van Hengel, 2015). Also van Vuren (2015) and de Jong (2015) ‘allowed’ the contractor to involve subcontractors.

⁹¹ Original quote (in Dutch): “als je samenwerkt dan moet je ook bij elkaar zitten en dan kan je ook elkaar kunnen gebruiken.”

⁹² Original quote (in Dutch): “Er kan er maar één de baas zijn. Dat is altijd het beste, anders krijg je veel te veel discussie”

⁹³ Original quote (in Dutch): “Als overheid wil je niet voor de knulligheden van de private partij opdraaien.”

⁹⁴ The exception is a preference of de Jong (2015) for a duration of 10 years in case of complete public financing. This preference is, however, more related to the instability of availability of public financing than of the ‘characteristics’ involved in largescale replacement.

(system) and its behaviour, which requires at least a 10 year learning period (Albrecht, 2015). Second, longer time periods will offer an opportunity to innovate and earn the investments back (de Jong, 2015). Third, it tackles strategic behaviour of contractors that prefer profits over life-cycle management (Waltje, 2015). A downside of the longer duration is that market parties may go bankrupt before the contract ends (van Hengel, 2015). Besides, the maintenance need of an object is difficult to determine for a period of 5 years or longer (Michon, 2015), which leads to difficulties related to long-term performance goal formulation. Waltje (2015) states it as follows: *“you don’t know what is going on in your network 10 years from now.”*⁹⁵ Because of the uncertainties coming along with replacement, interim evaluations are strongly advised in case of long-term contracts.⁹⁶ Since it is difficult to lay all relevant responsibilities down in a contract at the start of such a complex ‘project’ as replacement Stuwten Maas a learning process should be adopted, which means the responsibility division will be completed over time. Furthermore, a further specification of performance targets over time is considered beneficial: the higher the uncertainty of development of network performance requirements over time over time due to the influence of external factors, the higher the risks will be, the higher the risk premium the contractor will pass on to the client (Michon, 2015). It is important these changes in scope, result and agreement are made with mutual acceptance in order to prevent strategic behaviour of one the parties (van Vuren, 2015). Flexibility is also a means to keep both the public and private parties on track, but above all to gradually specify the general goals determined at the beginning. Preferences for flexibility differ from having regular ‘specification moments’ to ad hoc adaptations founded on mutual consent (Albrecht, 2015; de Jong, 2015; van Hengel, 2015; van Vuren, 2015).

The contract as a ‘vehicle’ to shape the boundaries, mechanisms and procedures

“A contract will always be necessary” (Michon, 2015) if only because of gaining access to public financial means (Albrecht, 2015). In general one agrees with this statement. The contract is considered valuable for however the content of the contract leaves more room for discussion. Some consider an agreement on the main issues sufficient. This entails a result that is functionally described and performance based, an agreement on the availability of network information (de Jong, 2015), an agreement that arranges division of responsibilities (van Vuren, 2015) and an arrangement that defines the geographical scope, the initial available budget (resources) and a mechanism to shape the process of further development of the agreement over time (Albrecht, 2015; Michon, 2015). The agreement is in this sense a means to express each other’s expectations at the start of the cooperation (van Hengel, 2015). The allocation of resources should be sufficiently arranged in the contract as to achieve the agreed performance goals (van Hengel, 2015; Waltje, 2015), financial resources in particular (Albrecht, 2015). The agreement may not be completely non-binding, but each party should have the freedom to determine the allocation of resources such that it can optimize its own processes, while achieving the required performance (van Vuren, 2015). De Jong (2015) adds that the ‘resource relation’ with parties outside of the agreement should be arranged, for example: to ensure the input of knowledge from knowledge institutes during the project. Also the initial scope setting should be regulated by means of a contract.⁹⁷ The majority prefers a general scope which is demarcated by the client, where the contractor may determine itself which intervention activities to execute as long as the performance targets are met (Albrecht, 2015). Furthermore, a contract is also of added value with regard to managing interaction and coordination, since it ensures that the essential decisions are made, such as risk allocation, availability and allocation of financial resources and decisions regarding the determination of the replacement moment, such as formulating guidelines for asset design (Albrecht, 2015; Waltje, 2015). Client–contractor evaluation moment should also be formally arranged (Waltje, 2015). *“In case cooperation turns out as expected, one does not need much formal arrangements. However, when it does not go according to plan, one need to have formal arrangements.”* (Albrecht, 2015).⁹⁸ A typical example of ‘shaping’ boundaries and mechanisms for ‘shaping’ contractor behaviour is performance based governance. A result in terms of performance goals is mostly preferred, be it that these goals need to be sharpened during the agreement duration.

⁹⁵ Original quote (in Dutch): “je weet niet wat er over 10 jaar met je netwerk aan de hand is.” (Waltje, 2015).

⁹⁶ Interim evaluations also have another advantages, namely that the number of risks that have to be assured are dramatically decreased. This will save both parties a significant amount of money (Michon, 2015).

⁹⁷ One exception: van Hengel (2015) prefers a completely open scope.

⁹⁸ Original quote (in Dutch): “Als je een goede samenwerking hebt je vaak overlegd hoe je daarvoor niet veel formeel geregeld te hebben. Als het echter niet goed gaat dan moet je formeel wel het één en ander geregeld hebben.”

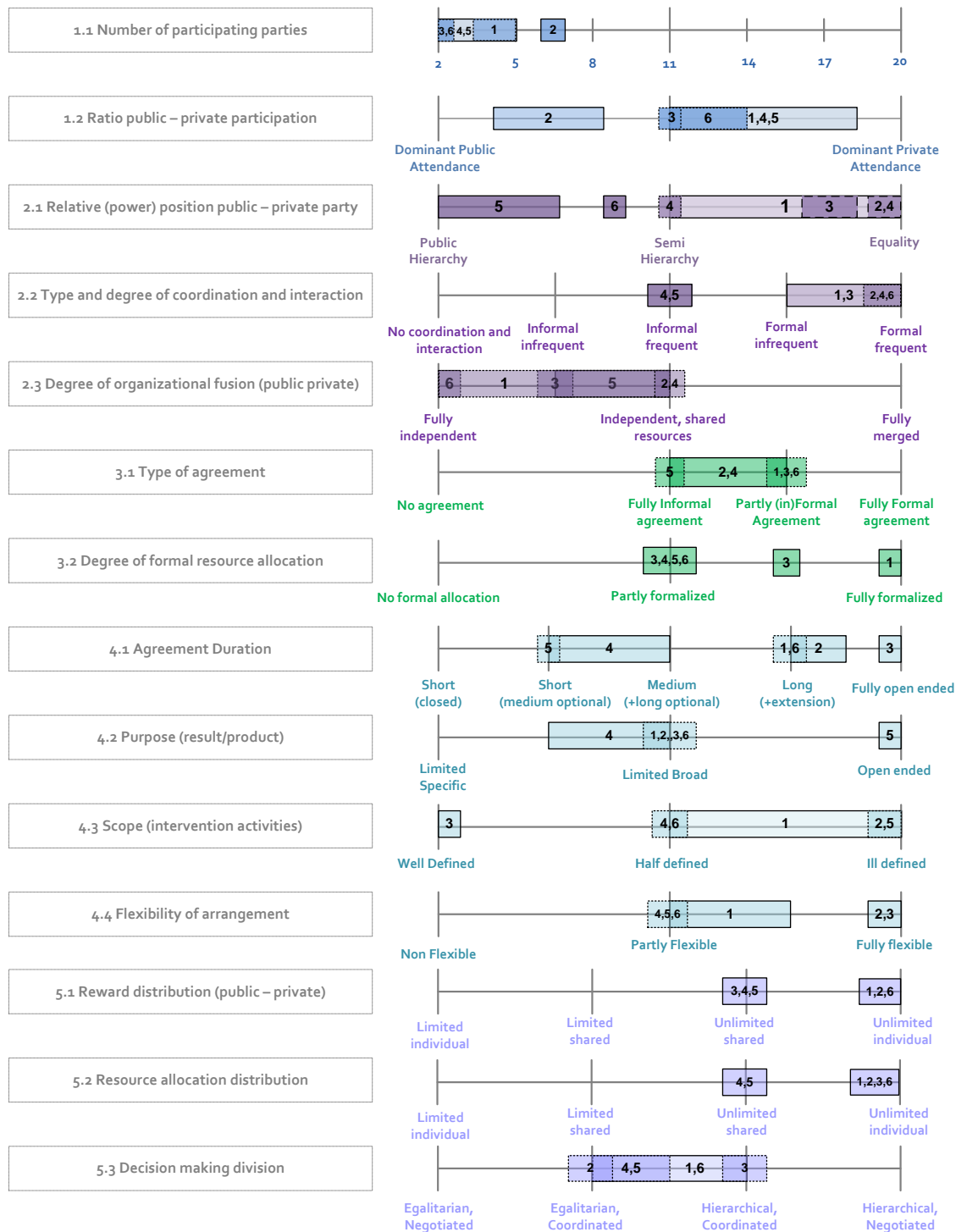


Figure 19 Overview of element values from case study interviews (developed by researcher)

Note. 1 = Michon; 2 = van Hengel; 3 = Waltje; 4 = Albrecht; 5 = de Jong; 6 = van Vuren

6.7 Conclusion

Before starting this concluding paragraph, first of all it is important to notice that all results of the case study interviews present expectations and opinions. The conclusions need to be interpreted as such. Despite that the respondents have considerable expertise on and experience with public-private partnerships, their expectations might be falsified in practice. Nevertheless, the conclusions are presented here are very useful for the purpose of this study: exploring the role and potential effects of public-private arrangements to be used for infrastructure replacement.

Replacement task division: cooperation prevails

With regard to the task division preferences a threefold division becomes visible. The client should define the performance targets of the national (external) networks and to a lesser extent sets the acceptable risk levels. The contractors should be given the operational tasks, such as maintenance tasks and performance monitoring including data collection for efficiency purposes. These are the tasks the market currently also fulfils. Most of the tasks however are considered to be best executed jointly, be it that the client has the end responsibility. This applies to determination of the investment need based on the performance target, determining the replacement moment and strategy and stakeholder involvement. So, the task division for replacement seems to shift towards cooperation, where the client ‘sets’ the boundaries in order to safeguard public values and the contractor can optimize within these boundaries. At the same time these boundaries are set jointly, such that more value can be created, and they are (more) realistic.

The general line of thought frequently addressed in the interviews is when giving market parties the ‘freedom’ to design the replacement strategy, then this will lead to innovation, lower costs and higher network quality. This implies that the contractor also needs to have an important vote in identification, incorporation and prioritizing of stakeholder needs and requirements. Furthermore, the performance and evaluation criteria the client ought to fulfil need to stimulate out of the box innovations. In turn, this requires the client to formulate the performance targets together with the client stakeholders, such that the end solution receives support. In order to stimulate progress of the project, involvement of stakeholders and local infrastructure managers in the arrangement should be done with care, which implies letting a limited number participate. Also a financial contribution is required in order to prevent unrealistic requirements to be proposed.⁹⁹ It is furthermore advised to align the interests of all participating parties and formulate agreed upon goals, before the start of the replacement progress in order to stimulate innovation; there should be sufficient perspective for gains. Furthermore, joint exploration of the replacement strategy alternatives and opportunities may create a richer identification of risks, hence also creating opportunities for a suitable risk allocation, which in turn may lead to lower costs. There is a limit to effective flexibility of the arrangements; only if the circumstances allow and all participating parties are convinced of the added value.

‘Replacement arrangements’: a mix of cooperation and non-cooperation

This line of cooperation is ‘put forward’ with the arrangement values that are preferred. Cooperation comes to expression in the need for frequent interaction in early stages in order to determine substantive design matters, such as risk identification and allocation, budget (investment) agreements and initial scope. Client and contractors are expected to possess complementary skills, knowledge and expertise, such that replacement is best served by a joint efforts: the client possesses detailed system knowledge, which is essential for such huge impact decisions that come around when replacing, while contractors are expected to have the skills to develop high quality technical design and innovative solutions. Complete client contractor equality is however not advised, since the client would like to intervene when necessary. The contract mainly fulfils a facilitative role: it sets the boundaries of the project with regard to performance, allocation of resources, responsibility division, and control, interaction and coordination mechanisms, of which evaluation plays an important role. When it comes to payments and cost sharing the cooperative spirit seems to be partly lost. Both client and contractor seem to prefer separation of resource allocation, costs and rewards, though cooperation requires a pain/gain share mechanism, which implies equal sharing of costs savings and additional costs. Given the long timeframe involved in strategic replacement, long contract duration are preferred. In order to respond to the changing circumstances that occur in this timeframe, interim assessments will be made and the scope, end result and time duration may be changed by means of mutual consent. In this regard the cooperative spirits seems to be restored.

⁹⁹ The line of reasoning underlying this statement is as follows: if stakeholders contribute financially to the project, they take risks, have a stake in the project and will be incentivized to assure the project will be a success.

7. Evaluation and Validation

The foregoing chapter presented public-private task alternatives and matching public-private arrangements for the replacement challenge in the Stuwven Maas case that were considered to be beneficial for quality, cost-effectiveness and stimulation of innovation. In order to generalize the results of case Stuwven an evaluation session was held, during which three 'task allocation-arrangement-combinations' were evaluated on the criteria costs, quality and degree of innovation.¹⁰⁰ Section one presents the results of the evaluation session. These results are discussed in section two and compared with the results of the case study. Furthermore, the conclusions of the case study and evaluation session are placed in perspective by means of a comparison with empirical studies on the effects of public-private partnerships and cooperation.

7.1 Results

Importance and impact of performance based governance

Performance based governance is of essential importance for public-private cooperation. First of all, the use of performance targets stimulates innovation for they provide the contractors with the freedom to optimize the network intervention activities according to their own preferences. The use of performance targets also has a downside. Performance targets are easily formulated either too ambitious, or too conservative. Setting targets too high will lead to extra costs, because the contractor will continue to work as long as it is financially beneficial. This danger is especially applicable if the client hands over the identification and prioritization of stakeholder requirements.¹⁰¹ From a quality point of view these performance measures are best set and realized when formulated jointly by the local infrastructure managers, stakeholders, client and contractor. A realistic formulation of performance indicators is key to success of the public-private arrangement. This is not to say they are not subject to change. Especially contracts with a long-term focus need intermediate adoption of performance targets in order to respond to changing circumstances. Adoption of performance targets is best served by mutual consent, even though this might lead to extra costs.¹⁰²

Three other, 'absolute' requirements were mentioned for applying the use of performance targets effectively, such that advantages are achieved. First, performance targets need to be clearly explainable. Second, the client needs to have sufficient knowledge to formulate, communicate and evaluate the performance targets. Third, the client needs to have trust in the capabilities of the contractor. These requirements seem rather straightforward, though are difficult to achieve in practice: "it is of essential importance how other parties interpret the formulation of your performance targets. It requires special skills."¹⁰³ The main challenge for the client with regard to performance measurement is to set the initial quality performance targets quality and the initial budget at the right level. Otherwise, the contractor may provide too much quality, leading to too many costs. A profit sharing mechanism, such as cost saving sharing, is considered a sufficient incentive for contractors to go for performance optimization.

¹⁰⁰ The three alternatives were formulated based on task allocation and arrangements as composed by respondents. Appendix 11 provides a detailed overview of the evaluation session setting, the documents that were used and furthermore provides an overview of the results. Appendix 11 provides an overview of the results of the evaluation session.

¹⁰¹ A trade-off situation is occurring: handing over this tasks to market parties might end in 'innovative solutions' that satisfy stakeholder requirements in case of sufficient budget, but might 'over-engineered' (too much capacity). However, in case of too limited budget, too little attention is paid to stakeholder requirements, since the contractor will minimize the costs of the projects in order to achieve at least a minor profit. The initial budget is therefore believed to be of crucial importance for success.

¹⁰² Adoption of performance targets require negotiations to take place, which require organizational capacity, hence lead to additional costs.

¹⁰³ Original quote (in Dutch): "Jouw prestatiedoelen worden heel belangrijk in de formulering, hoe die door de ander worden uitgelegd. Dat is ook een vak apart."

The need for flexible and long-term contracts

Long-term contracts can be advantageous, since they ‘force’ the contractor to continuously optimize the performance of the asset. That means with every intervention decision that is made, this long-term perspective will be addressed such that sustainable assets will be built. In order to achieve this effect, the contract needs to be accompanied by a financial incentive structure that leads to optimizing the lifecycle of the asset. This will also stimulate innovation: “*market parties will invest (and innovate) as long as they see an opportunity for profit.*”¹⁰⁴ It is advised to align the contract duration with the ‘throughput time’ of asset(s). For example, if a network contains asset(s) that reach end of lifetime 20 years from now, the contract should at least cover a 50 year period in order to provide the incentive to design assets that are easy to maintain. Long-term contracts stimulate cooperation by implicitly providing checks and balances: “*you have to find a balance together, even were it to consider a break-up.*”¹⁰⁵ There has to be an incentive to cooperate in order ‘keep up with each other’ for such a long time. An example is a long-term investment required for developing an innovative solution, which is jointly agreed upon. A downside of long-term contracts is the risk of bankruptcy of the contractors.

Role and influence of stakeholders and local infrastructure managers

By means of involving stakeholders and local infra managers in the goal formulation phase, network quality will be highest and the performance goals will be best met. However, it is considered to block innovation, since the performance goals are achieved by means of consensus. Consensus is required to align the interest of all parties, and create commitment. Handing over the stakeholder involvement tasks to contractors is generally received with scepticism. Contractors are expected only to execute this task sufficiently when they are forced by the client via adequate performance targets.¹⁰⁶ Even then, there is much potential for conflict between client and contractor. It is expected the contractor will limit the inclusion of stakeholder requirements and opt for higher profits. Also the inclusion of stakeholders and infra managers in the arrangement will lead to tensions: “*that diversity of interests is hardly manageable in the early stages. This will almost certainly lead to problems during execution phases.*”¹⁰⁷ This can be tackled by the creation of a trust relation. Even then cooperation is fragile: “*One little spark can light a fire.*”¹⁰⁸ Because of these uncertainties and the ‘tendency’ of stakeholders to show risk adverse behaviour innovation are expected to be limited in case of direct stakeholder involvement.¹⁰⁹ However, the upsides are a higher network quality as a result of negotiations and more commitment during the complete replacement process by involved stakeholders. Also costs may be decreased in case of direct stakeholder involvement from the start, since it will prevent unexpected changes during later phases.¹¹⁰ Local infra managers and stakeholders such as water boards may be very reserved with accepting the management authority of contractors and show risk adverse behaviour, which may lead to ‘over-engineered’, hence costly solutions.

The ‘pros and cons’ of public – private cooperation

Long-term contracts will also lead to the incentive for both contractor and client to ‘get the best out of each other’, since cooperation is the best instrument for parties to achieve their goals in a long term relationship. In order to achieve cooperation it is required the contractor profits from the potential cost reductions achieved by cooperation. Tough equality between contractor and client is considered to positively contribute to project outcomes, a certain

¹⁰⁴ Original quote (in Dutch): “marktpartijen zullen innoveren zolang ze daar geld mee kunnen verdienen.”

¹⁰⁵ Original quote (in Dutch): Je moet een soort consensus vinden ook al is het maar over het feit dat je op een gegeven moment uit elkaar

¹⁰⁶ These performance targets are deemed necessary, because it is expected contractors will prevail profit over a high quality solution, that satisfies more stakeholder requirements. One can argue whether outsourcing of this task will be ever advantageous.

¹⁰⁷ Original quote (in Dutch): “en omdat je het hier hebt over meerdere partijen zie je daar dat die belangen bijna nooit goed te managen zijn aan de voorkant en dat je dan tijdens de rit gegarandeerd als een hele lastige gaat ervaren.”

¹⁰⁸ Original quote (in Dutch): “er hoeft er maar één partij de boel te flessen en het is gedaan.”

¹⁰⁹ During the evaluation session there was no consensus on how to tackle this ‘problem’. Some participants expected more innovation would be unlocked in case the client translated the stakeholder requirements to performance targets, which are in turn given to the client, since this will create more room for innovation (more clear targets). Others denied this effect by stating that in case the client shows risk adverse behaviour, the performance targets would be so detailed no innovation could occur. “*In the end every party will bring in its own interests.*”

¹¹⁰ On condition decisions are made within time. There is risk on lengthy decision making rounds.

degree of client hierarchy is considered to be necessary in case the contractor underperforms.¹¹¹ In order to bring about changes with regard to performance targets, scope and allocation of resources (financing), mutual agreement is considered a good instrument, since it will keep the interests of both parties aligned. A downside of this instrument is that innovation may be hampered: good cooperation comes at the cost of innovation, as consensus needs to be achieved. Innovation requires a solid foundation and straight, clear, demarcated agreements in order to establish secure pay-offs that will unlock the initial investments required for innovation.

In general it is considered beneficial to have only one contractor involved. Efficiency gains are expected, as the need for coordination is lessened. Involving multiple contractors may be beneficial for the ‘competitive pressure’ that will keep the costs down and may stimulate innovation for the involvement of multiple contractors enables ‘cross-pollination’ to occur.¹¹² However, it will also create mutual discussion about responsibilities and the division of costs and responsibilities. Also risks are believed to be better allocated and managed when given to a consortium. Nevertheless, single contractor involvement was preferred.

Next to the advantages, cooperation can also bring disadvantages, especially when multiple parties are involved: alignment of interests may only be possible by means of consensus building, which leads to sub-optimal solutions, such as over-engineered assets that satisfy the requirements of a risk adverse actor, which makes the end solution more expensive for all actors. For the exact same reason, cooperation may also hamper innovation to occur: *“I dare to state: the more cooperation, the less innovation.”*¹¹³ This example indicates that cooperation is only beneficial if the common goals of the parties are compatible (see section 2.1). Another essential requirement of cooperation is a trust relationship between client and contractor. This brings us to the last conclusion of the evaluation session.

Implementation of public-private cooperation requires an institutional change to occur

Introducing long-term, flexible contracts based on the concept of cooperation while capturing the positive effects mentioned in this chapter, requires a change of attitude of both contractors and client as is clearly indicated by the following quotes: *“if you want to do this kind of arrangement, you almost have to go to a different institutional setting”*¹¹⁴ and *“the Dutch infrastructure sector is not ready for these arrangements yet.”*¹¹⁵ These quotes point at the current trust deficiencies between contractors and Rijkswaterstaat. During the past years numerous projects have showed that Rijkswaterstaat promised contractors to provide the freedom to design their own solutions, which would be evaluated on functional specifications or pre-defined performance targets. In reality it often occurred that additional requirements were brought in or ‘new’ risks were allocated to the contractor. Also the strong profit oriented behaviour of contractors is an obstacle to real public-private cooperation. Concluding, it can be stated that trust need to be developed first, before real public-private cooperation can occur effectively in the Netherlands.

7.2 Conclusion

The results of the evaluation session confirm the findings of the case study in several ways. First, the need for and effects of performance based governance are confirmed. Second, the ‘dual’ effect of involvement of stakeholder and local infra managers in the arrangement setting is acknowledged. Third, a preference for single contractor involvement is confirmed. Fourth, the need for and expected positive effects of long-term and flexible contracts is stressed again. Also the downsides of public-private cooperation have been addressed. Public-private cooperation is still considered beneficial, however ‘within limits’. Additionally, the ‘requirements’ for public-private cooperation have been ‘deepened’, the importance of the ‘right’ institutional setting in order to achieve the potential added value of public-private cooperation in particular.

¹¹¹ During the evaluation session it was stated that the power of the client should be such that it could dismiss the client in case of serious underperformance.

¹¹² Involving one contractor means involving one contractor that is responsible. This contractor has the freedom to involve subcontractors. In case these subcontractors possess a diversity of expert knowledge, innovation is still likely to occur.

¹¹³ Original quote (in Dutch): “Ik durf te stellen dat samenwerking leidt tot minder innovatie.”

¹¹⁴ Original quote (in Dutch): “Als je dit gaat doen moet je naar een andere, ik zou bijna zeggen institutionele setting.”

¹¹⁵ Original quote (in Dutch): “En ik denk op dit moment is zeg maar de grote wereld (..), de grote infrastructurele die staat daar nog niet voor klaar.”

What can be concluded from the repeatability of the case study results? It must be noted once again, that the effects of public-private arrangements, performance based governance a certain public-private task allocation as reported in this study present expectations. As both the case study and evaluation session show, real effects of public-private arrangements are a product of behaviour and choices of participants, combined with the impact and development of external influences. Arrangements as such fulfil above all an institutional role in that they demarcate the choices of the participants and incentivize their behaviour, aimed at a preferred outcome. As a result, the expected effects of arrangements are unpredictable. The ‘causal mechanisms’ that is often assumed to exist between public-private arrangements and project outcomes, is in reality one amongst many.¹¹⁶ The expectations of the public private arrangements as are proposed in this study need to be interpreted with care.

7.3 Reflection: placing the results in perspective

The conclusions above have been based on expectations. How do they relate to empirical research? Phrased differently: to what extend is it going to work in reality? This section will reflect on the findings by discussing the results with recent findings of similar studies. Attention will be paid to both the client-contractor relationship on project outcomes, as empirical studies to the effects of public private partnerships.

Effects of a cooperative client – contractor relationship

First of all, the suggested move towards more public-private cooperation and the subsequent preference for more informal and relational arrangements in order to achieve improved project outcomes follows the outcomes of recent research. Ling et al. (2013) found that good, cooperative relationships between contracting parties lead to improved client satisfaction, cost performance and time performance.¹¹⁷ The initial phase of a project, the so-called formative phase, is the ideal moment to create a cooperative relationship between parties, which can be stimulated by goal alignment (Love et al., 2010).¹¹⁸ Love et al. (2010) furthermore found that the joint development of the project result and the solutions contributing to his by means of ‘integration of different types of know-how’ lead to the formulation of project goals that create value for money and the commitment required to achieve these goals. The use of contracts is strengthened if they are a result of alignment of objectives, contain clear procedures for division of responsibilities, and are flexible, i.e. reconstruction and further specification during the project. In this sense the contract is becoming a means to define and manage expectations, limit opportunism, but above all sets the boundaries; within these boundaries informal, relational behaviour can occur. Coordination efforts and the resolution of conflicts are better arranged informally than formally. Other findings relate to a fair risk distribution, i.e. a pain/gain share allocation and a clear defined allocation which is aligned with the equity position of parties, improve cost performance and client satisfaction. Ling et al. (2013) also found that the relational approach also has a downside: renegotiation and further development of the end result and scope may lead to lengthy processes of consensus agreements. Flexible contracts, combined with a flexible attitude of participants towards unexpected changes lead however to improved time performance.

These findings once more state the added value of public-private cooperation. The emphasis on of the importance of the initial phases on project success is aligned with the findings of this study, as is the role and function of the contract. However, also differences can be found. The arrangements that were composed in the case study do not unanimously support a pain/gain share. Furthermore, this research showed a preference for a general and open scope, instead of a detailed and clear responsibility division at the start of the project. Does this mean that the arrangements found in this study will not be successful? No, however it indicates that real cooperation and a real relational relationship is not preferred. In practice, this may lead to a moderate added value of public private arrangements for infrastructure replacement.

¹¹⁶ This characteristic is common among ‘socio-phenomena’: “*socio-phenomena are highly diverse, subject to many different and cross-cutting forms of causation*” (Little, 1993, p. 204). Besides, actors (individual agencies) are capricious, giving rise to probabilistic behaviour, which will make the expected outcome even more uncertain (ibid).

¹¹⁷ This research contained empirical survey data from Singapore; an evaluation study to influence of relational contract approach to public constructions project performance. The survey population contained public officials, private consultants and contractors.

¹¹⁸ This research focussed on price competitive alliances in Australia. Goal alignment is defined by Love et al. (2010:954) as follows: “*the establishment of objectives that all parties could clearly understand and adhere to.*”

Empirical effects of Public-private Partnerships worldwide

The application of public-private partnerships (PPPs) and their advantages have been widely supported in scientific literature, almost taking on euphoric proportions. The use of PPPs as a means to realize infrastructure projects has taken a flight during past decades worldwide. Recent empirical research shows a diverse image of the effects of PPPs however. Evaluation of the effects shows a diverse image.¹¹⁹ An overview study of PPP evaluation studies worldwide reports shows significant positive effects, such as 11% cost savings compared to traditional projects in Australia, and a 76% on budget and 78% on time score compared to 30% and 27% traditionally in England (Hodge & Greve, 2009). On the other hand, a study to 227 European road infrastructure projects showed that the projects are on average 24% more expensive than expected costs of traditional executed projects, ironically the same number as the realization costs of traditional projects (ibid). What this indicates is that the success of PPPs is not as evident as is often stated. One can even argue that the effects of PPPs are often deliberately misrepresented.¹²⁰ This may also be a clarification of the diversity of effects found with regard to DBFM (Design-Build-Financing-Maintain) and PFI (Public Finance Initiative) contracts worldwide. These projects are often 'promoted' for their cost savings; the real effects are somewhat disappointing. An evaluation of the PFI initiative in Britain led to three conclusions why PFI results did not meet the expectations (HM Treasury, 2012):

1. Insufficient flexibility, leading to either to high rewards for the contractor or a financial burden for both client and contractor.
2. Insufficient transparency concerning financial progress of the project: lack of client to 'steer' the project.
3. In some cases irresponsible transfer of project risks to private parties.

Despite the high expectations of public-private partnerships, reality have showed to be far more obstinate than is often assumed. The advantages that are often accredited to PPPs do not necessarily materialize in a PPP project. Hence, the expected effects of the use of public private arrangements for infrastructure replacement need to be interpreted with care.

Empirical effects of Public-private Partnerships in the Netherlands

Relatively few PPP projects have been executed in the Netherlands. The projects that have been initiated started between 2002 and 2006 and are not completed yet. Hence, ex post evaluation is not possible yet. Ex – ante evaluation studies of seven PPP projects show positive costs savings effects, ranging from 2% to 19% compared to traditional projects (Klijn & Twist, 2007).¹²¹ It needs no explanation that the real cost savings can only be calculated afterwards. The cost savings of DBFM(O) projects until the moment of writing are 10-15% on average and accumulate to a total amount of €1.3 billion (Ministerie van Financiën, 2014). What can be said with certainty is that the construction phase of these projects is significantly improved compared to traditionally executed projects: the projects are delivered within time, sometimes even earlier than agreed upon (Ruding et al., 2008; Ministerie van Financiën, 2014). However, the real 'value for money' and innovation that was aimed for is seldom achieved.¹²² (Eversdijk & Korsten, 2008). Eversdijk & Korsten (2009) blame the 'disappointing' results to the strict tendering and planning procedures and incorporation of public stakeholder requirements, which lead to very little room for the

¹¹⁹ Hodge & Greve (2014) acknowledge the difficulty of evaluation the effects of PPPs compared to traditional projects for three reasons: first, lack of 'substantive empirical evaluation measures'; second, both PPP and traditional projects have appeared in a wide variety of forms; third, only a limited of evaluation studies have really evaluated the projects performance (many projects are ex-ante evaluations, likely because of the long duration of PPP projects).

¹²⁰ The political influence in the realization of infrastructure projects may be a clarification for the PPP propaganda. Several authors argue that governments have used the term PPPs to 'frame' infrastructure expenses positively. See for example Linder (1999); Teisman & Klijn (2002); Wettenhall (2003); Eversdijk (2013). After all, deliberate misrepresentation of (expected) infrastructure costs by governments is not uncommon (Flyvbjerg, Skamris Holm, & Buhl, 2004).

¹²¹ Tough a DBFM/PFI based PPP is one PPP form out of many, empirical evidence used in this study is limited to these particular partnerships, simply because other ex-post data is not available. Very recent other initiatives such as MultiWaterWerk and Bouwcampus have been implemented, there is no empirical research available however of the ex-post effects.

¹²² Eversdijk & Korsten (2009) draw a parallel between the uprise of the use of DBFM and reorganisation of Rijkswaterstaat. They consider the 'outsourcing' of former RWS tasks as a logical consequence of the restructuring process. This has important consequences for the findings of this study.

client to develop and apply innovations. Another reason is related to risk adverse behaviour of contractors. Contractors, when given the opportunity to innovate, occasionally choose for secure pay-offs by means of providing a proven solution. Furthermore, risk adverse behaviour of banks played an important role. DBFM only seems to be suitable to optimize the construction process and create life cycle efficiencies. Involvement of market parties does not automatically lead to more innovation as appears from the HSL case (Eversdijk & Korsten, 2008). An extensive case study research by Eversdijk (2013) on three so called alliance PPPs shows that despite the best intentions of the participating parties to come to real cooperation and risk sharing, 'practice' is different.¹²³ Risk adverse behaviour, strict separation of responsibilities and a strong emphasis on strict contractual agreements prevail.

The current 'institutional capacity' of the Dutch Water Sector

The arrangements proposed in this research require both 'cooperative' skills of client and contractors. The most evident skills are risk identification and allocation, formulation of effective performance targets, infrastructure network design and long-term plan development. Furthermore, parties need to have a cooperative attitude, which ensures the potential added value of public private partnerships is achieved. For example, both contractors and clients need to be in favour of innovation in order to let it take-off. The main requirement for innovation is the willingness to take financial risks without having a guarantee these investments are earned back.¹²⁴ During the development process itself, both client and contractor need to show commitment and firmness to achieve the desired end-result, while at the same time is realistic and able to quit the project in case the opportunities for a positive net result are not reasonable anymore. The aim of this section is to found out to what extent the arrangements have chance on success. These findings will be based on a recent research to the institutional capacity of the Dutch (water) infrastructure construction sector.

Willems & Busscher (2014a) indicate that the Dutch water sector still approaches infrastructure projects traditionally (i.e. using a linear management approach), which hampers innovation to occur. Besides, local infrastructure managers favour existing, proven technologies over new, promising, unproven technologies (ibid). Effective public-private partnering requires a sufficient level of institutional capacity, which is a product of social capacity (i.e. the degree to which stakeholders cooperate within a network), intellectual capacity (i.e. knowledge development and knowledge exchange) and political capacity (i.e. firmness to act collectively) (Willems & Busscher, 2014a). Real cooperation, which is based on mutual trust and an equal power relation between Rijkswaterstaat and market parties, is currently rather limited due to the strong emphasis on project management mechanisms, and a tendency of Rijkswaterstaat to allocate as much risks to market parties (Willems & Busscher, 2014a). As a result innovation is limited and a certain degree of distrust exists. The dominant project approach also limits the transfer of learning effects between Rijkswaterstaat and market parties, which limits the development of intellectual capacity and mutual transfer of useful knowledge.¹²⁵ Besides, the to the downsizing of Rijkswaterstaat during the past decades has led to a decrease of intellectual capacity, resulting in a hampering risk identification and assessment (Willems & Busscher, 2014a). With regard to the political capacity there is also much to gain. The classical 'clash' between client and contractor as a result of conflicting interests has created distrust and can severely limited cooperation (ibid).¹²⁶

What does this show? Real cooperation is difficult, intended advantages of PPPs are everything but certain to be realized, and the cultural and institutional barriers are difficult to breakthrough. It also means that the expected effects of the proposed arrangements and public – private task allocation need to be interpreted with care. The development of governmental institutions, the relation between government and market and the subsequent development of governmental and market knowledge, expertise and public-private role division are a result of an evolutionary process, covering a time span of decades to ages (Williamson, 2000). The next chapter will propose recommendations on how to bridge this gap.

¹²³ The following cases were examine: A2 Hooggelegen, Tweede Coentunnel, and HSL-Zuid.

¹²⁴ In addition to these basic requirements, an equal time scope between stakeholders is of essential importance for stimulating innovation. Recent research shows that this might lead to conflicts between private and public parties (Eshuis & van Buuren, 2014).

¹²⁵ A dominant project approach at Rijkswaterstaat has led to changing projects teams, which hamper the creation of a sustainable relation between market parties and Rijkswaterstaat: on each new project a new team of contractors and client need to work together. This also hampers a project overarching transfer of learning effects.

¹²⁶ The financial crisis has certainly contribute to this, as the Dutch construction market has faced difficult times, in which infrastructure projects were executed for budgets (far) below the project costs.

8. Conclusions and Recommendations

Now the arrangements are generalized it is time to formulate the conclusion and recommendations. This research started with questioning the role of market parties for strategic replacement of infrastructure. Throughout this whole report, time and time again it became clear that the role of market parties cannot be uniquely defined. However, the options of roles and arrangements have been brought down to reasonable proportions. This chapter will present the concluding findings of this research.

8.1 Main Conclusions

Based on the findings of this research, five conclusions can be formulated. These conclusions relate both to the role of market parties in strategic infrastructure replacement and the arrangements to be used accordingly.

Conclusion 1: Market parties are indispensable to strategic infrastructure replacement

Market parties are considered to best fulfil the operational tasks, both with regard to the management of the objects and network itself, such as maintaining, designing, construction, and monitoring and evaluation of performance. This is the current core business of market parties, hence they can deliver these ‘services’ more efficient and effective than the client, Rijkswaterstaat. When it comes to the ‘real’ replacement tasks a joint approach is advised, because the client’s system knowledge combined with the technical and ‘project’ expertise of market parties is expected to lead to added value in terms of lower costs, higher network quality and the stimulation of innovation. This applies to determination of the investment budget based on the performance targets, determining the replacement moment and strategy, and stakeholder involvement. The ‘strategic’ decision making responsibility involved in replacement should be kept in public hands, as a result of the importance for society and the expected conflict of market values with public values (i.e. profit vs. societal optimum).¹²⁷ These strategic tasks concern the formulation of network performance targets and formulation of acceptable risk levels. This is not to say that market parties cannot play a role in this: market parties can be of value by assisting in delivering the decision making information. The end responsibility however always lies with Rijkswaterstaat. Hence, public-private arrangements profoundly play a role with regard to the design of replacement strategy and the management of the network before and after the replacement moment. As such, the client above all becomes a network orchestrator, facilitator and integrator, which ‘steers’ the market parties by providing frameworks in which the market parties receive the freedom to design their own solutions.

Conclusion 2: Strategic Replacement is expected to benefit from long term, flexible and general arrangements.

First of all it must be stated that no single arrangement can be considered to be ‘the best’. Preferences differ, however there is a clear ‘pattern’ visible which indicates the need for long-term oriented contracts, that are flexible and general at the start, and which are ‘executed’ by a single contractor.¹²⁸ Besides, long-term contracts are more effective as they enable the contractor to get to know the network and hence can develop a more efficient replacement strategy.¹²⁹ Long-term contracts are furthermore necessary as a result of the long time frame involved in replacement: they force the contractor to continuously optimize the performance of the asset(s), over the complete life time of the assets. Finally, a long time span is beneficial for stimulating innovation and the need for mutual consent for preventing

¹²⁷ The societal optimum can be defined as the ‘point’ at which the sum of interests of all stakeholders that have a ‘stake’ at the functioning of the infrastructure network is maximized.

¹²⁸ During the case study interview it was stated several times that the current market parties do not have sufficient (financial) resources to be able to manage a complete network (comparable to Stuwten Maas) responsibly. Further institutional capacity need to be built in order to apply the single contractor concept (see recommendation 3).

¹²⁹ A replacement strategy is a ‘roadmap’, which covers the timespan from the current to the future, desired situation and which contains all network and asset intervention activities with regard to replacement (DHV, 2010).

strategic behaviour. When starting such an agreement with a long time span, setting the initial performance targets are of crucial importance, (even though they are ‘general’), as they will function as references point and set the boundaries within changes can occur.¹³⁰ The uncertainties involved in strategic infrastructure replacement lead to a preference for a general ‘description’ of end result, scope, division and the coordination of management tasks at the start, followed by further specification over time. A general initial arrangement also triggers market parties to create innovative solutions. Furthermore, the process of replacement can be streamlined, realistic goals can be set, and hence network quality can be improved. The involvement of a single contractor is preferred for efficiency purposes, as it saves coordination efforts by the client. Involving a single contractor may however also lead to strategic behaviour, resulting in higher prices and a lower quality level, in case the incentives for a long term orientation are not sufficient.¹³¹ The contract mainly fulfils a facilitative role: it sets the boundaries of the project with regard to performance, allocation of resources, responsibility division, and control, interaction and coordination mechanisms, of which evaluation plays an important role. In order to respond to the changing circumstances that occur in this timeframe, interim assessments will be made and the scope, end result and time duration may be changed by means of mutual consent. However, in case of serious underperformance an exit rule should always be available.

Conclusion 3: Arrangement become a facilitating mechanism as part of a public – private relationship that tends to resemble cooperation

The preferred client-contractor relationship is shifting towards a real partner like relationship in which the client (Rijkswaterstaat) and the private parties commit themselves to the execution of a replacement challenge that is still partly in the unknown and needs further exploration and development. To this extent, the arrangement becomes a mechanism that facilitates contractor and client along the process of strategic replacement. It sets the communication and interaction procedures (i.e. intermediate evaluation and performance change), procedures for further specification of the replacement strategy, and exit options in case the cooperation does not work out as intended. When it comes to payments and cost sharing the cooperative spirit seems to be partly lost. Both public and private parties were hesitant to commit to real cooperation. The adoption a real pain/gain share mechanism in which costs savings and additional costs are equally shared is not preferred. Hence, the arrangement resembles a ‘light’ variant of cooperation. It tries to prevent the downsides of a full cooperative like setting (i.e. harming a trust relation by committing strategic behaviour), but try to catch the upsides. The performance targets set in the beginning will for a large part determine the outcome of the arrangement, even if they serve as ‘general’ boundaries. Hence it is expected, that communication is very intensive in the beginning, less intensive at the end. Also having stakeholders and local infrastructure managers involved at the beginning may lead to more commitment during the process.

Conclusion 4: Realizing the benefits of these arrangements is uncertain and requires however an ‘institutional change’

The arrangements and public private task division presented above have much potential. The beneficial ‘expectations’ can however not be taken for granted. Recent experiences with public-private partnerships have showed that they have brought less positive effects than initially expected. The current ‘institutional setting’ in the Netherlands is still based on competitive tendering procedures, and is highly price-oriented. These are in contrast with the cooperative setting (mutual trust) required to let the arrangements succeed. Stated differently, sufficient institutional capacity need to be build, before the expected positive effects of public-private arrangements can materialize. Furthermore, the success of cooperation like arrangement always depends on the actual behaviour of both contractor and clients. Contractors should also be willing to innovate and take risks (see recommendation 3).

Conclusion 5: Replacement remains a balancing act

The conclusions formulated above might suggest that public-private arrangements for strategic replacement may be rather straightforward. Part of the balances mentioned in the introduction still apply, yet can be redefined and be

¹³⁰ The use of adaptive pathways can be very useful for this purpose (see Haasnoot, Kwakkel, Walker, & ter Maat, 2013),

¹³¹ Intermediate evaluation moments, based on predefined performance targets can prevent strategic behaviour. The prospect of contract extension is a sufficient incentive to stimulate cooperative behaviour of the contractor (Leendertse, 2015). The capacity of market parties is currently too low to let a replacement process execute by a single contractor (de Jong, 2015).

made more specific to the replacement context.¹³² In addition to these trade-offs, a fourth is formulated quality vs. innovation. The trade-offs are as follows:

Trade-off 1: Balancing between control and freedom: Freedom is still believed to be key to innovation and efficiency gains in replacement. Replacement can have significant negative effects on network functioning and performance, as have innovations. Disruptions are always lurking and can have large negative impacts.¹³³

Trade-off 2: Balancing between horizontal and vertical relationships Horizontal, equal relations have been widely acknowledged as prerequisite to get the most out of strategic replacement: joint scope setting, joint risk identification and allocation and joint development of the replacement strategy are all considered to add value. However, the ‘shadow of hierarchy’ should always be apparent. Strategic behaviour is always lurking within public-private cooperation, especially in current client-contractor relations. In case the cooperation goes wrong, the public client should have the option available to unilaterally unbind the agreement.

Trade-off 3: quality vs. innovation (and costs): involving stakeholders at the early phases of the arrangement in order to formulate the performance goals, and risk levels, will lead to a higher quality network, however is expected to lead to less innovation.

The trade-offs make clear that Rijkswaterstaat need to make choices on which ‘trade-off values’ to prefer. More on this in recommendation 3.

8.2 Recommendations

What is to be recommended to deal effectively with the infrastructure replacement to come? These recommendations concern Rijkswaterstaat as infrastructure manager?

Recommendation 1: Focus on performance measurement and incentives

The added value of public private partnering (cooperation) lies in smartly bundling each other’s forces. This can only be achieved if sufficient freedom is given to market parties and thereby give market parties the opportunity to develop smart solutions. Performance based governance and incentives play a key role to achieve this. Incentives unlock innovation, incentives shape behaviour, and hence incentives are inevitable for public-private arrangements. Performance measurement skills need to be the main skill of Rijkswaterstaat and should include the coordination of performance between networks. Of special importance are the incentives that stimulate innovation and network quality. Formulating the right incentives is especially important for long term contracts. Rewards for cost-efficiency can help to a great extent. The client needs incentives that keep the contractor away from only focussing on costs. This also means Rijkswaterstaat has to have a clear perspective on the future and has clear understanding of the system (system knowledge) (see recommendation 2). Focussing on performance management also means having more trust in market parties and providing them ‘the real freedom’. This requires building social capacity (see recommendation 3), which in turn will create trust. Managing expectations, clear, undisputed, realistic and agreed upon performance targets are believed to be essential.

Recommendation 2: Maintain system knowledge and develop a clear view on the future

Closely related to the first recommendation is the recommendation to maintain system knowledge. No matter how much tasks are handed over to market parties, system knowledge will stay essential for the client to have. It is the

¹³² The competition vs. cooperation trade-offs is considered not applicable anymore. Section 7.3 has showed that price competition can in the end lead to higher costs as a consequence of using a too low risk budget in order to cut costs. Furthermore, cooperation may lead to lower costs due to lower transaction costs and need for interventions by the client. The transaction costs vs. gains trade-off is also removed. The true gains of cooperation are difficult to estimate at the beginning of the replacement process. Hence this trade-off cannot be adequately ‘managed’ at the start of the cooperation. Further research is required to develop early contractor involvement procedures in order to optimize the transaction costs and gains in a cooperative setting.

¹³³ Recent repetitive malfunctioning of the new Botlek Bridge (renamed ‘Fyra-Bridge’ by critics), lead to much commotion. Road users and authorities, such as Port Authority Rotterdam and several municipalities publicly voiced their displeasure (van Heel & Teitsma, 2015).

current ‘main asset’ of the client. System knowledge entails knowing the functioning of the system, the role of objects in the system, the nature of their connections and their contribution to system performance. System knowledge will enable the contractor to formulate realistic and effective performance goals, evaluate the performance of the contractor(s) and have a decisive vote in determining the future design of the network. Market parties can contribute much to strategic replacement, however formulating a clear vision on future system design creates the certainty market parties need, hence may stimulate innovation. This vision on the future need to entail the required performance levels, prioritizing of network functions on a national level (project overarching) and as such can serve as a first step in the (national) replacement process. It is recommended to already involve stakeholders and market parties in this. Furthermore, the vision should also ‘lead’ to a choice on the replacement trade-offs, of which quality versus costs and innovation is the most important one.¹³⁴ Rijkswaterstaat hence also has important role in shaping the relation between market and stakeholders (see recommendation 3). The ‘view’ on the future also embraces a view on the public – private role division. Specific choices to be made concern how to coordinate networks and between networks: decentral or not? How to ‘stay in control’ of critical, operational processes. It is important to make a clear role and responsibility division, such that market can develop itself.

Recommendation 3: Build institutional capacity by bundling forces smartly, focused on cooperation

The current ‘institutional setting’ is not suitable to implement long-term, flexible, general arrangements that are to be specified over time (i.e. the institutional capacity is not sufficient). Developing institutional capacity is required to let the replacement arrangements advantages take place.¹³⁵ First of all, cooperation needs to be stimulated (i.e. building social capacity). Most important to this extent is building trust relationships and respecting and acknowledging each other’s knowledge and expertise. For Rijkswaterstaat this means ‘walking your talk’ and keep interventions (i.e. contractor governance) limited to performance measurement. It furthermore implies developing procedures and ‘mechanisms’ in which early market involvement can thrive and conditions for cooperation can be developed. An example of this is the formation of a pool of cooperation parties that will execute the replacement tasks. Also market parties need to contribute: Second, improving intellectual capacity. For Rijkswaterstaat this means indicating what knowledge the market parties should develop. Which problems to solve? The reason of public-private arrangements lies in the synergy of combining each other’s strengths. This firstly implies knowing each other’s strengths and eliminate as much ‘double’ knowledge and expertise as possible. A certain degree of overlap will be required, in order for the client to be knowledgeable enough to evaluate the performance of the contractors and formulate suitable performance indicators. Furthermore, learning experiences should be captured. A standardized form of public private task allocation may help here.

This brings us to the third aspect of developing institutional capacity: creating a clear public – private responsibility division (i.e. political capacity, decisiveness). This includes the public-private task division in strategic replacement projects. Market parties need this division to develop their skills, especially when it comes to the more ‘strategic’ tasks, such as stakeholder involvement. Given the time required to build institutional capacity, it is recommended to start as soon as possible. It needs to be stressed that building institutional capacity is not solely a responsibility of Rijkswaterstaat. It is a joint product of contractors and client. Creating trust requires mutual effort.

Recommendation 4: Further develop (specify) long term arrangements which stimulate cooperation

The arrangements proposed in this research are fundamentally different from current arrangements. They have to be seen as a first design towards more detailed arrangements. As such they require further specification, which is done together with market parties. A standard format could be developed. Further specification of long term arrangement is required to make them beneficial. This especially concerns the process of further specification of scope, result and the agreement duration over time. A clear responsibility division is important, as is a clear process at the beginning of the long term arrangement: when to evaluate, what to evaluate, what decisions will be needed when? Adaptive pathways might help out here. It furthermore concerns the incentive structure, of which the cost and reward division and the resource allocation play an important role: which incentive structure leads the beneficial cooperation effects,

¹³⁴ For example, focussing on water safety and high availability of assets will lead to less room for innovation.

¹³⁵ The concept of institutional capacity and the operationalization of it (social, intellectual and political) is derived from Willems & Busscher (2014a).

such as stimulation of innovation and lower costs to occur? Serious Games and simulation may help out to figure this out (see 8.2.1). Stimulation of cooperation also requires partner selection criteria that ‘appreciate’ quality and create room for creativity, instead of merely focussing on costs. Therefore it is recommended to further examine the effect of incentive structures on arrangement outcomes. It is recommended to start the search for implementable quickly. Building the ‘facilitating’ and required institutional capacity for this long term arrangements takes considerable time. In addition to this, current DBFM contracts can form a ‘danger’ to the network approach, since they are very inflexible and determine the performance of a network for at least 20 years, hence limit the opportunities for the application of new arrangements.

8.2.1 Recommendations for further research

The main aim of this research was to generate explorative public-private arrangements as starting point for more elaborate designs, such as formulation of matching contracts. First, it must be stated that the effects of the replacement arrangements are based on expectations. Further research is required to the validation of these results. What is the consequence of outsourcing stakeholder involvement and prioritization on arrangement outcomes (innovation, costs and qualities)? Do general, flexible, long term contracts indeed result in higher network quality, lower costs and innovation? Since the effectivity of arrangements for a large part is determined by human (soft) factors, it is important to focus more on this perspective. Serious games could be used to simulate cooperative settings in infrastructure and experience with arrangement settings (see Altamirano, 2011; Herder & Wijnia, 2012). Furthermore, further research is advised into the outsourcing of critical, operational tasks for infrastructure replacement at the operational level. The biggest fear of the client was not being able to intervene in case of emergency. A second suggestion of this research relates to generalizability of the findings of this research to other countries and (infrastructure) sectors.¹³⁶ A third suggestion relates to the legal side of public – private arrangements. The European Union formulates detailed and strict guidelines on market involvement in general (tendering). Are these findings implementable from a legal point of view? Fourth, special attention needs to be paid to an assessment framework for arrangement selection and partner selection, besides the expected effects on project outcomes (i.e. costs, innovation and network quality). Outcomes are highly uncertain, while intermediate evaluation processes and contractor behaviour may have significant influences on the end result.

¹³⁶ As regards the Dutch Road Infrastructure sector, the findings of this study are aligned with this research of Leendertse (2015), who aimed at effective market involvement in management and development of public infrastructure networks. Chapter 9 covers the similarities and differences between the studies in more detail.

9. Reflection & Discussion

Now the conclusions and recommendations have been formulated, it is time to look back. In this chapter the research will be critically reflected upon and discussed. Additionally, the research approach, research methodology, scope, assumptions and findings will be discussed.

Reflections on the scope

The arrangement concept as defined in section 2.2 has had an important influence on the scope of this study. In this study the contextual factors have been largely left outside of the scope. That is, the arrangements that were formulated were based on the replacement context in the Netherlands. The institutional context is, however, addressed by means of use of recent studies on the institutional and market capacity in the Netherlands (c.f. Willems & Busscher, 2014a; Leendertse, 2015) and as such is considered to be addressed sufficiently. In contrary, the legal context has been left out, which means that further research has to be conducted into the legal component of public private arrangements in order to arrive at implementable arrangements (see section 8.2.1).

From the beginning of this research the network perspective has been used to conceptualize the replacement context and to shape the public-private task allocation and role division. This has amongst other led to the categorization of replacement tasks and formulation of alternatives. The relationships between the replacement tasks have hence not been investigated in detail. The combination of the network perspective and asset management has led to an implicit emphasis on a rational and analytic approach of the replacement challenge. In reality, the tasks will show strong interfaces and cannot not be easily separated. Further research on the dependencies of the tasks and above all how they shape the client contractor relation and arrangement and its effect on the arrangement is necessary. What furthermore has to be noticed is that the choice on how to demarcate the network is a deliberate choice; a choice made by an actor, and that needs to earn understanding and agreement from other actors (Roovers, 2012). It is important do to this carefully and to have achieved agreement before actual starting the replacement process.

Reflections on the research approach and methodology

The sequence of the research approach may have influenced the outcomes of this research. The definition of the framework and task alternatives may have forced respondents to go with a certain line of thinking. Ideologies and political influences may have influenced the perception of effects of certain forms of arrangement values. Also the sequence of the questions, which resembled the sequence of the arrangement elements, may have influenced the answers; answers on the first questions make some answers on subsequent questions more favourable in order to arrive at a consistent arrangement.

A limited number of respondents have participated in this study. Though it is believed that both public and private views have been addressed adequately, the reliability of findings might be improved by extending this research within the Netherlands by involving a larger group of respondents. Financial institutions, banks for example, often play an important role in the management of (large) infrastructure projects. Their involvement in the design of public-private arrangements can bring a 'richer picture' of the opportunities and preferences within the public-private spectrum.

Evaluation of arrangements and selection of alternatives for case study Stuwten Maas is based on expected value. Every respondent indicated more or less that the arrangements and alternatives were not compatible with the current institutional context. Even though respondents were encouraged to think out of the box, it can be assumed that the current institutional setting (and experiences) may have influenced the outcomes of the interviews. During the

evaluation session only ‘private participants’ were presented. This could have led to too little attention being paid to the public point of view. Evaluation of the alternatives by public participants is therefore proposed.

Two frameworks have been developed in this study; the infrastructure management framework and the arrangement framework. These frameworks have not been validated, with the exception of one expert validation on the arrangement framework. The frameworks have been designed with great care. During the case study and evaluation session no signals were recorded about the incompleteness of the frameworks. As such the frameworks are considered to be sufficiently designed for this research’s purpose. Further validation may help in creating a more reliable arrangement framework.

Reflections on (initial) assumptions

Contractors have been considered a homogenous group of actors. In reality there are several ‘types’ of contractors, with different expertise, hence they can fulfil different roles in a strategic replacement process. In line with building institutional capacity, intellectual capacity in particular, this differentiation is important since ‘construction companies’ also have different preferences than engineering companies: Construction companies simply want to build, while engineering firms are also interested in participating early development phases (Willems & Busscher, 2015). Furthermore, the influence of financial institutions (banks) on the public private arrangements has been left out of this study. Especially in DBFM like settings banks have a major influence in the management of (large) infrastructure projects. It is advised to involve banks in the further specification of new public-private arrangements.

The last assumption concerns the rather rational approach of asset management. This rational approach emphasizes the use of clear goals, targets and performance measures for achieving a high quality network and efficient infrastructure network management practices. Even though clear and solid performance targets are important, more loose performance targets may also be valuable, since they create room for negotiation between actors and can lead to windows of opportunities (Roovers, 2012).

Reflection on the findings (results)

The influence of the downsizing Rijkswaterstaat went through (and is currently going through), may have influenced the findings of this study. Given the trend of the past decades on more outsourcing and the shift of Rijkswaterstaat role to a network director it is not a surprise one opts for more market involvement for strategic infrastructure replacement. Hence, generalizing the results of this study to other countries need to be done very carefully.

The findings of this research are in line with recent research executed by Leendertse (2015) who investigated the role and added value of market parties for infrastructure network development and management in the Netherlands. He also emphasizes the added value of cooperation, provision of the right incentives and the need for a knowledgeable public client that ‘steers’ the performance of market parties in the right direction, while still providing them with sufficient creative freedom to be of added value. In addition, Leendertse (2015) warns the Rijkswaterstaat to be careful with outsourcing operational tasks, since it can lead to control deficiencies in times of emergency, hence leaving the client with too little power to intervene and restore. Furthermore he advises to clearly divide the responsibilities in cooperation and also for the investments. Willems & Busscher (2014b) advocate more cooperation between government and market parties in order to provide innovative solutions for infrastructure object design sluices in particular, however indicate the struggle Rijkswaterstaat will face in providing this: the balance between control and freedom is indicated as the main challenge for the future. They also promote project ‘overarching’ cooperation in order to unlock the full potential of market involvement.

The results of this research seem to fit the trend both in practice and in scientific research that the importance of public private arrangements (and partnerships) is gaining more importance. The need for public private cooperation becomes ever more emergent. At the same time there is much unknown on how this public private cooperation should look like and how it can be embedded in current practices, procedures and cultural setting. At the same time this development is ‘followed’ with a critical view: recent experiences with public private partnerships did not

convince everyone of the added value. However, there is no way back: the trend of handing over former public responsibilities to the market cannot be reversed.

We will have to wait a couple of decades before the real effects of these long-term, cooperative arrangements become clear. Until then, the best we can do is designing arrangements by accounting for the known uncertainties and arm ourselves against the unknown unknowns by means of building in adaptivity and flexibility. This brings us to the final statement of this thesis:

“It is no longer the question whether public-private arrangements should be applied, the question is on how to align public-private partnerships within the (changing) institutional context, while anticipating on the future needs. The challenge of public-private arrangements is how to build them now and harvest their success in the future.”

Personal reflection

There is much to be investigated and much is unexplored, however I am convinced this study forms a useful starting point for further exploring and specifying public-private arrangements for strategic infrastructure replacement. During the execution of this research I have tried to make the abstract concepts of strategic infrastructure replacement and public private arrangements as concrete (specific) as possible. Therefore I hope this research is of value for both practitioners and the scientific community. All in all, the journey to the formulation of public-private arrangement has ended and I am satisfied with the result.

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Appendices

Appendix 1 Asset Management: an exploration of definitions

‘Strategic Asset Management’ (SAM) is a commonly used term scientific literature. However, there is no consensus on the ‘legitimacy’ of this term, since asset management can be considered to be strategically oriented in itself. This appendix provides an overview of asset management definitions and as such aims to stress the superfluousness of the addition of strategic to asset management.

Asset Management has been used over a wide variety of sectors and fields, from financial to the offshore industry. According to Herder & Wijnia (2012:31) the “most elementary definition” of asset management is “getting the best value out of assets”. This definition holds true for all fields in which asset management is applied. What differs is the explanation (determination) of best value (ibid). Given the scope of this research the remaining part of this section will mainly focus on managing physical assets, those in the infrastructure sector in particular, so called infrastructure asset management.

Due to the rapid development of the field of infrastructure management and infrastructure asset management since the 1990s, no simple, clear definition of infrastructure asset management exists (Schraven et al., 2013). Besides, the asset management concept is given several names, among them strategic asset management (The Institute of Asset Management, 2014), sometimes inconsistent with their meaning (Moon et al., 2009). Table A.1.1 shows an overview of asset management definitions. These definitions are not exhaustive, but show the variety of asset management definitions though. Despite the different definitions, they share common ground with regard to two aspects:

1. assets are used to achieve the organizational goals;
2. managing assets means considering the complete asset lifecycle.

These characteristics are in line with characteristics of good asset management, since asset management should be “strategic (in line with the organizational goals)” and has to “balance costs, risks and performance on different timescales.” (The Institute of Asset Management, 2014:5).

The definition of strategic asset management thus seems to be abundant. The following definition of strategic asset management shows that it adds no new things to the asset management definitions in table 1 (Vreeburg et al., 2013:1350): “Although not defined uniformly, the overall goal of SAM is to maintain assets in such a way that an optimal service be provided reliably against minimal costs.”

Wijnia & Herder (2009) use the term strategic asset management to emphasize the strategic use of asset management instead of the common asset management practice to focus on operation and maintenance only: namely the integrated approach in which asset management is used to contribute to organizational goals and a lifecycle approach is used. In the same sense the term strategic asset management will be used in this study.

Despite the difference in definitions of asset management, there is consensus that in order for asset management to be effective, asset management should fulfil a strategic role (cf. Wijnia & Herder, 2009; Too, 2010; Too & Too, 2010; Parida, 2012). In infrastructure asset management these goals are often derived from the public interest (Schraven et al., 2011).

Table A1.1 Overview of Asset Management Definitions

Author	Source	Definition
US DOT (1999)	Moon et al. (2009:27)	"Asset management is a systematic process of maintaining, upgrading, and operating physical assets cost-effectively"
Asset Management Council of Australia	Hastings (2010:4)	"The life cycle management of physical assets to achieve the stated outputs of the enterprise."
Hastings	Hastings (2010:4)	"Given a business or organisational objective, Asset Management is the set of activities associated with: identifying what assets are needed; identifying funding requirements; acquiring asset; providing logistic and maintenance support systems for assets and disposing or renewing assets, so as to effectively and efficiently meet the desired objective."
PAS 55	van der Lei (2012:4)	"Systematic and coordinated activities and practices through which an organization optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their life cycles for the purpose of achieving its organizational strategic plan."
The Institute of Asset Management	The Institute of Asset Management (2014:5)	"Asset Management gathers the knowledge and tools an organisation needs to use its assets to achieve its purpose."
ISO 55000	The Institute of Asset Management (2014:6)	"The coordinated activity of an organization to realise value from assets (an item, thing or entity that has potential or actual value to an organization)"
OECD / Federal Highway Agency (FHWA)	Verlaan & Schoenmaker, 2013:5)	"A systematic process of effectively maintaining, upgrading and operating assets, combining engineering principles with sound business practice and economic rationale, and providing the tools to facilitate a more organised and flexible approach to making decisions necessary to achieve the public's expectations."
British Standard Institute	Volker et al. (2013:441)	"Asset management is a systemic and systematic approach to building, maintaining, and decommissioning physical assets"

Appendix 2 Interview Protocol ‘Replacement Interviews’

Introduction

1. What are your experiences with asset management?
2. What are your experiences with infrastructure replacements / operation and maintenance of infrastructure objects?
3. What kind of replacements do these concern (wet / dry infrastructure)?

Strategic Asset Management

Initial question

4. How do you think about the use of operation and maintenance knowledge early in the infrastructure planning process (programme level)?

Follow up questions

If positive answer:

5. To what extent can this knowledge be used reaching infrastructure objectives (in an infrastructure replacement programme)?
6. In what way can this be achieved / What is necessary to achieve this?
7. What are the advantages of this approach for an infrastructure replacement programme?
8. Which asset management knowledge can be used for infrastructure replacement programme planning?

If negative:

9. What causes that this is not applicable?
10. Which ways are there to take this blockades away?

Asset management in the Netherlands

Initial question

11. How is asset management currently being applied (used) in operations and maintenance of ‘wet civil infrastructure objects’?

Follow up questions

12. To what extent are private parties involved in this?
13. Which information is gathered and monitored by the infrastructure manager?
14. To what extent is this information linked with higher levels in the infrastructure planning process?
15. To what extent are asset management knowledge and principles used for infrastructure programmes (and planning)?
16. To what extent are asset management knowledge and principles used for infrastructure projects (and planning)?

Public-private arrangements

Introductory question

17. What is your experience with the involvement of private parties in infrastructure management?

Initial questions

18. In what ways can private parties be involved for replacement of infrastructure?
19. Which roles can private parties fulfil in the process of infrastructure planning?

Follow up questions

20. What effects do you expect from this (in terms of advantages / disadvantages)?
21. Where are these effects determined by? / What determines these effects?
22. Under what circumstances do these effects appear?

Appendix 3 Interview Protocol Case Study Interviews

Deel 0: Introductie [5-10 minuten]

1. Wat is uw rol binnen de organisatie waar u werkzaam bent?
2. Hoe bent u betrokken bij de vervanging stuwen Maas?

Deel 1a: Inventarisatie huidige publiek private arrangementen [15 – 20 minuten] (optioneel)

1. Voor welke activiteiten worden marktpartijen ingeschakeld?
2. Wat is de achterliggende reden voor het inschakelen van marktpartijen?
3. Hoeveel marktpartijen zijn er ingeschakeld op het moment in het hele areaal?
4. Waar worden de marktpartijen op aangestuurd? (+ achterliggende reden)
5. Wat is de looptijd van de contracten? Waarom is voor deze looptijd gekozen?
6. Waar worden marktpartijen op geselecteerd?
7. Hoe wordt de huidige staat van de objecten bijgehouden en gemonitord?
8. Zijn er medebeheerders die een rol spelen?

Deel 2: Inventarisatie rol marktpartijen bij vervanging maastuwen (20 – 30 minuten)

1. Voor welke rol kunnen marktpartijen ingeschakeld worden (+waarom wel/niet)?
 - a. **Internal coordination**
 - i. Het formuleren van prestatiedoelen en prestatienormen voor het areaal & object?
 - ii. Het meten van de prestatie van het netwerk en objecten op deze doelen?
 - iii. Het vaststellen / bepalen van het investeringsbudget voor het areaal?
 - iv. Het identificeren, plannen en evalueren van onderhoud op grond van prestatiedoelen?
 - v. Het bepalen van het vervangingsmoment en strategie inclusief ontwerp?
 - vi. Het inventariseren van externe factoren en de impact op het netwerk?
 - vii. Het formuleren van acceptabele risicowaarden en dit gebruiken in de besluiten?
 - viii. Het inrichten van de data verzameling voor een netwerk (op basis van netwerk doelen)
 - b. **External coordination**
 - i. Formuleren van lange termijn prestatiedoelen voor en tussen hele netwerken
 - ii. Formuleren van lange termijn investeringen (gebaseerd op LCC)
 - iii. Voorspellen van lange termijn ontwikkelingen externe factoren + impact
 - iv. Vertalen van lange termijn inter-netwerk doelen naar netwerk specifieke doelen (middel lange termijn)
 - v. Formuleren van een data collectie strategie voor netwerk om de strategische doelen te kunnen meten en realiseren
 - vi. Lange termijn capaciteitsplanning tussen netwerken
 - vii. Het integreren van asset management data naar strategisch niveau (inter-netwerk)
 - c. **Stakeholder involvement**
 - i. Inventariseren van de stakeholderwensen en deze meenemen in de besluitvorming? (+ koppelen aan risicoprofiel)
 - d. **Synchronization**
 - i. Inventariseren van wensen van medebeheerders (+ koppelen aan risicoprofiel)
 - ii. Afstemming van activiteiten met de medebeheerders op grond van hun wensen

Deel 3: Toetsing arrangementen (40 - 45 minuten)

Na een korte uitleg van de alternatieven en taakverdeling wordt per alternatief de volgende vraag gesteld:

Hoe denkt u dat de alternatieven 1, 2 en 3 scoren op de volgende evaluatiecriteria:

- a) Totale kosten (publiek / privaat) = efficiency?
- b) Kwaliteit (netwerk kwaliteit is afgeleide/ draagt bij aan doelbereiking van de clients = goal achievement)
 - o Het behalen van de (netwerk)doelen van Rijkswaterstaat (client)?
 - o Het behalen van de doelen van de stakeholders
 - o Het behalen van de doelen van de lokale infrastructuur manager.
- c) Innovatie
- d) Relatie publiek privaat (*optioneel*)

Nu worden de bijbehorende arrangementen getoetst.

- 1. Hoeveel partijen moeten betrokken zijn bij het beheer van het netwerk?
 - a. Hoeveel marktpartijen?
 - b. Moeten de stakeholders (& lokale beheerders) opgenomen worden in het arrangement zelf?
- 2. Hoe moet de relatie tussen opdrachtgever en opdrachtnemer zijn? (hierarchisch / gelijkwaardige machtspositie?)
- 3. Hoe moet coördinatie en interactie tussen opdrachtgever en opdrachtnemer geregeld zijn?
 - a. Informeel frequent,
 - b. formeel infrequent
 - c. formeel frequent?
- 4. Hoe moet de organisatorische scheiding publiek en private partijen zijn?
 - a. Volledig onafhankelijk
 - b. Onafhankelijk maar met gedeelde resources
- 5. Hoe formeel dient de overeenkomst zijn?
 - a. Geen overeenkomst / Informeel (relational) / formeel (contractueel)
 - b. Formele (omschreven) toewijzing van resources = volledig vastgelegd.
- 6. In welke mate dienen de volgende zaken vast te staan aan het begin van de overeenkomst en als ze vast staan, hoe lang moeten ze dan duren?
 - a. Het product / dienst (resultaat)? (=purpose)
 - b. De duur van de overeenkomst?
 - c. Opbrengsten / kostenverdeling?
- 7. Hoe flexibel moet de overeenkomst zijn: de gemaakte afspraken in het begin, aanpasbaar tijdens de duur van de samenwerking?
- 8. Hoe moet de verhouding tussen inleg en opbrengsten tussen publiek en privaat zijn?
 - a. Opbrengsten/inkomsten afhankelijk van resultaat?
 - b. Gelijkwaardig verdeeld of niet?
- 9. In hoeverre dienen de besluiten die de betrokken partijen maken met betrekking tot de infrastructuur (planning, onderhoud, aanleg, investeringen)
 - a. Gelijkwaardig te zijn (geen autoriteitsverschil)?
 - b. Gecoördineerd te worden, zodat ze afgestemd worden op de wensen van alle betrokken partijen?

Appendix 4 Evaluation session: preparation and description

In this appendix the evaluation session is described in detail. This is done by firstly providing the preparation information (set-up) of the evaluation session in section A4.1. The designs that are formulated for evaluation are given in section A4.2. Section A4.3 shows the planning of the evaluation session. Finally, section A4.4 provides the documentation the participants received during the session.

A4.1 Preparation

This part is based on Tremblay et al. (2010). In case of quotes or paraphrases an explicit references has been made.

The following steps should be followed to execute a focus group research (Tremblay et al., 2010, p. 601):

1. Formulate research problem: why is the focus group needed?
2. Identify Sample frame: number of groups, size of groups, source of participants
3. Identify Moderator
4. Develop and Pre-Test a Questioning Route
5. Recruit Participants
6. Conduct Focus Group
7. Analyse and Interpret Data
8. Report Results

Ad. 1: The focus group will be used to evaluate the suitability of the arrangements considered 'suitable' from the *Stuven Maas case* in order to generalize the results for to other replacement 'projects' in the Netherlands

Ad.2: Focus groups should 'have participants with similar characteristics' (Tremblay et al, 2010:602). Participants should be selected based on their relevant expertise for evaluating the artefact. All participants are employees of Antea Group and have experience with infrastructure projects where public-private partnership have been used. A group size of 6-8 participants is considered optimal (ibid). During the session 8 participants were attendant. Multiple focus groups can improve the quality of the evaluation process. As much focus group should be conducted until 'nothing new is learned'. It is advised to run 5 focus group, of which one is a pilot. However due to the limited time budget available for this research, only one focus group was arranged.

Ad.3: 'Good' moderation is important during focus groups "due to the open-ended nature" (Tremblay et al., 2010:604) and can be achieved by (ibid) a) respecting participants and allow everybody to express their views freely; b) provide means for clear communication both orally and in writing; c) listening 'truly' and control the use of personal views; d) be friendly and have a sense of humor; e) involve all participants in the discussion / conversation. The researcher functions as moderator, assisted by an participant that has much experience with providing workshops.

Ad.4: The questioning route determines the development of the group discussion and 'should be closely aligned with the research objectives' (Tremblay et al., 2010:604). A maximum of 12 questions for a 2 hour session is advised.

Ad.5: At May 13th 18 digital invitations have been send. Eventually, 4 Participants accepted the invitation to join the session at June 16th. Two participants provided input afterwards.

Ad.6: The focus group was conducted at June 16th at the Antea Almere Office. 2 hours were reserved. During the session audio recordings have been made. The moderator has also made notes.

Ad.7: The audio recordings have been transcribed afterwards and the notes were documented.

Ad.8: Results can be found in chapter 7.

A4.2 Designs to be evaluated

Six task-arrangement-combinations result from the case study. Given the limited time budget available for the focus group (2 hours) not all six combinations can be evaluated in detail. Therefore it is chosen to evaluate four combinations that cover the diversity amongst the case study results. The following combinations have been chosen:

1. Alternative 1: Task Alternative 2 (see figure A4.1) + Arrangement Waltje (see number 3 in figure A4.5)
2. Alternative 2: Task Alternative 3c (see figure A4.4) + Arrangement van Hengel (see number 2 in figure A4.5)
3. Alternative 3: Task Alternative 3b (see figure A4.3) + Arrangement de Jong (see number 5 in figure A4.5)

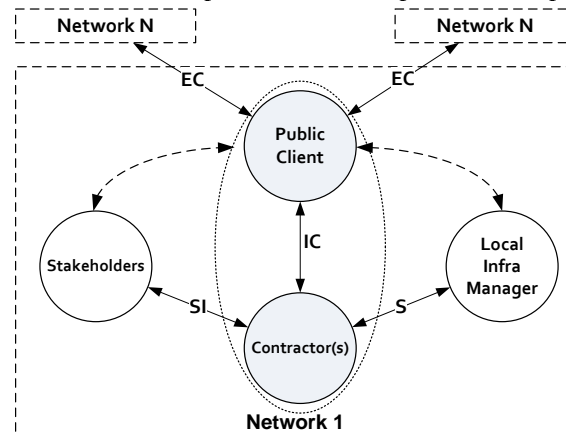


Figure A4.1 Task Alternative 2

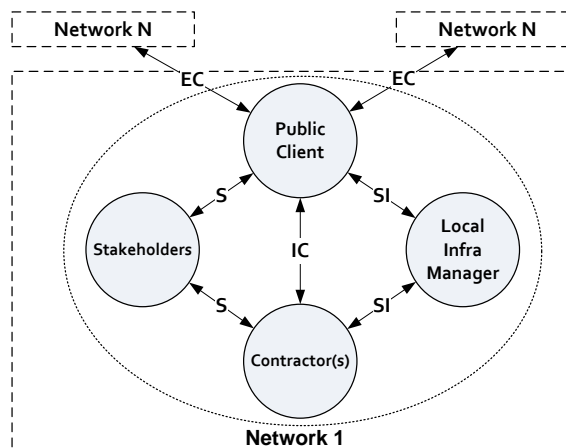


Figure A4.2 Task Alternative 3

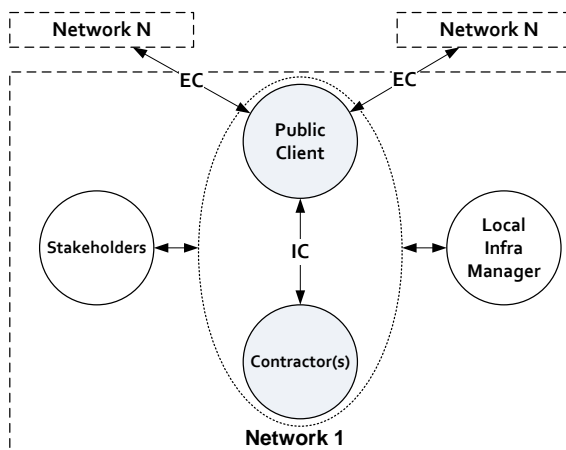


Figure A4.3 Task Alternative 3b

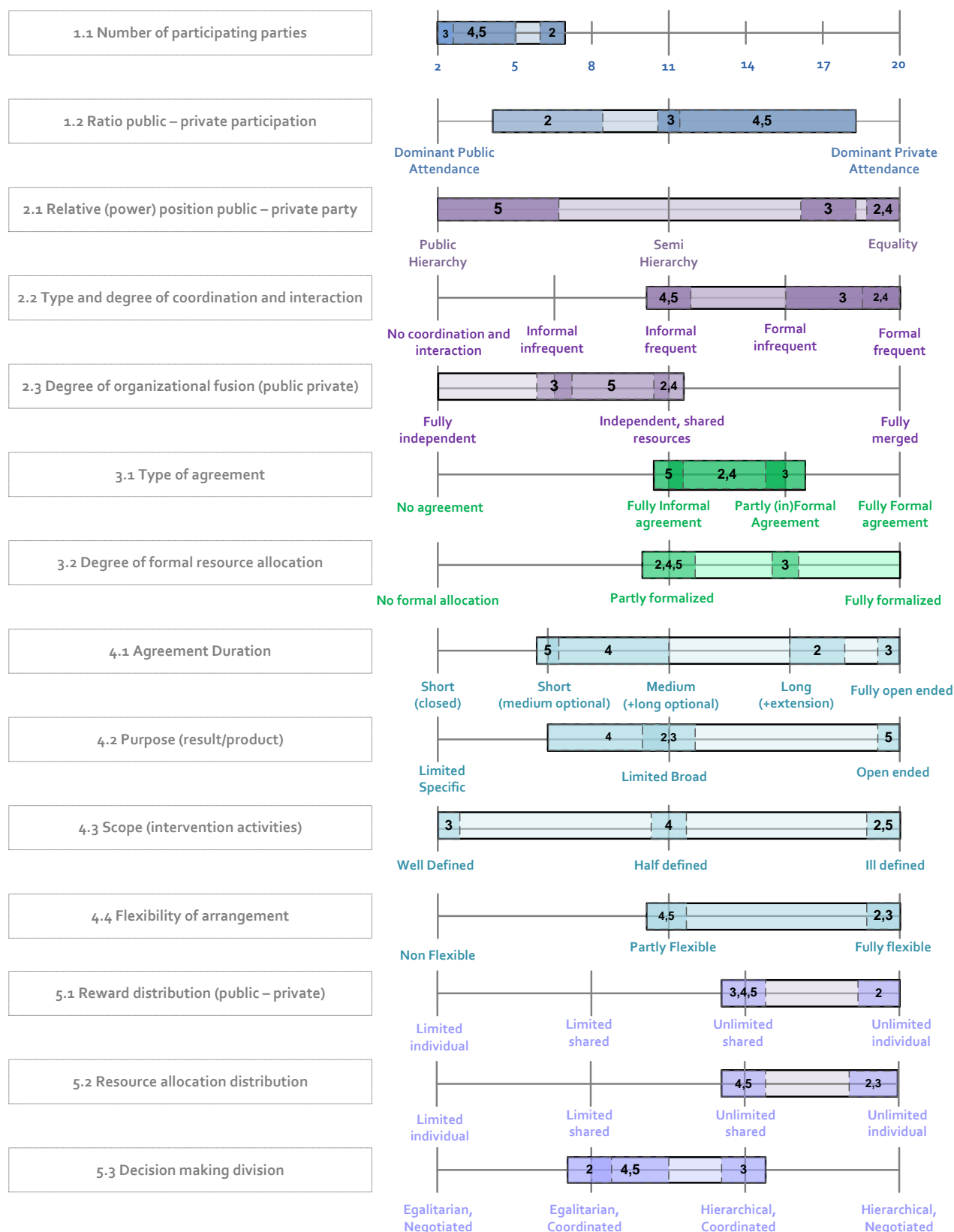


Figure A4.4 Overview of covered element values for evaluation session alternatives (2 = van Hengel; 3 = Waltje; 4 = Albrecht; 5 = de Jong)

A4.3 Evaluation session schedule

The schedule of the evaluation session will be as follows:

1. 'Welcome' and Introduction 15 minutes

- Introduction to research and positioning of evaluation session within research
- Purpose of evaluation session: Generalizing results of Case *Stuwen Maas*
- Presentation of results case study *Stuwen Maas*
- Explanation of session 'events' and program
- Instructions
- Possibility for the participants to ask questions

2. Evaluation of alternatives 30 - 45 minutes

Four groups will be formed out of the 8 participants. Each group will receive one of the four task-arrangement-combinations. They will be asked to discuss the 'suitability' of the arrangements for a replacement project similar to *Stuwen Maas*. It is left over to the imagination of the participants to come up with a similar case themselves. Each participant will receive the alternative-arrangement combinations on paper, guided by a description of the alternatives and an in depth explanation of the arrangement values. They will also receive a form at which they can write down their findings, that is the expected effects of the alternatives (see alternative evaluation form, section A4.4.5).

3. Short break [optional] 5 minutes

4. Communication of results 15 minutes – 20 minutes

Each group of participants will present their findings concisely. During each 'presentation' the task-arrangement-combinations in question will be showed on a large screen. Participants are requested to save their questions for the plenary discussion.

5. Discussion of results 30 minutes

A plenary discussion follows. Participants have the opportunities to ask other groups about their evaluation of the arrangements and the 'underlying reasons' for their outcomes. The plenary discussion will end with giving each group the possibility to adjust the evaluation of their alternative-arrangement-combination on a separate form. A centralized voting for the 'most suitable' alternative will close the discussion. Participants are asked to fill out their choice for the 'most suitable' alternative on a separate form (see voting billet form, A4.4.5). In case time is left, participants receive the opportunity to make adjustments to the four alternatives. Discussion: do these results also 'count' if the network perspective is left?

6. Conclusion 10 - 15 minutes

The results of the evaluation session will be plenary discussed. Participants will be gratefully thanked for their participation.

A4.4 Documentation

This documentation will be handed out during the evaluation session. Documentation is written in Dutch since all participants are native Dutch speakers.

A4.4.1 General Arrangement explanation

This general explanation will be provided with all task-arrangement combinations

Afbakening, scope en perspectief

We bekijken de vervangingsopgave vanuit Rijkswaterstaat als landelijke infrastructuurbeheerder en dus als opdrachtgever. Rijkswaterstaat is dan ook beheerder van de objecten. De onderstaande taak-arrangement combinaties gaan uit van een netwerkperspectief, waarbij de objecten die vervangen moeten worden onderdeel uitmaken van het netwerk. Andere benamingen voor netwerken zijn areaal of systeem. Het netwerk kan als een afgebakend geheel beschouwd worden, zowel functioneel als geografisch. De focus is voornamelijk op de interne activiteiten van het netwerk. Rijkswaterstaat is verantwoordelijk voor het goed functioneren van het netwerk en de afstemming met andere netwerken.. Aan het netwerk als zodanig kunnen prestaties toegeschreven worden. Voor een nat netwerk is dat bijvoorbeeld de afvoercapaciteit of de doorvaartijd voor schepen. De objecten (assets) dragen bij aan de netwerkprestatie en leveren zelf ook een prestatie. Het netwerk en de objecten vervullen diverse functies, zoals bescherming tegen hoogwater, regulering van de waterstanden in de omgeving of het faciliteren van scheepvaart. Stakeholders hebben belang bij deze functies en kunnen zowel lokaal, regionaal als (inter)nationaal georiënteerd zijn. Als laatste zijn medebeheerders betrokken die een deel van de beheeractiviteiten van de objecten uit kunnen voeren. Denk bijvoorbeeld aan een brug die in beheer is bij Rijkswaterstaat, maar waar het beheer van de weg door de Provincie gedaan wordt.

Het efficiënt beheren van een netwerk vraagt om de volgende taken:

1. **Doelformulering en prestatie management:** Het opstellen van prestatiedoelen en eisen voor het functioneren van het netwerk.
2. **Monitoren en evalueren:** Het monitoren en evalueren van de prestatie van het netwerk en de objecten in het netwerk.
3. **Budgettering en planning:** Het bepalen van het benodigde investeringsbudget en (capaciteits)planning, inclusief het maken van de beslissingen die hieraan bijdragen (aanleg, onderhoud, beheer en vervanging)
4. **Voorspellen:** Het voorspellen van de ontwikkeling en impact van externe factoren op het presteren van het systeem / netwerk. Denk aan waterhoogtes en volume groei van scheepvaart.
5. **Risicomanagement:** Het opstellen en formuleren van acceptabele risicowaarden, in overeenstemming met de netwerkdoelen en beschikbare middelen.

Bij deze taken horen de volgende verantwoordelijkheden:

1. **Externe coördinatie:** Het afstemmen van de prestatiedoelen voor het netwerk in kwestie met dat van andere netwerken, zowel aangrenzend als overkoepelend om zo de beoogde netwerkprestatie te behalen.
2. **Interne coördinatie:** Het afstemmen van de beheeractiviteiten en – beslissingen van alle objecten in het netwerk op grond van de beoogde netwerkprestatie. Onder beheeractiviteiten wordt verstaan: onderhoud, vervanging, aanleg en ontwerp.
3. **Synchronisatie:** Afstemming van de interne beheeractiviteiten- en beslissingen met die van medebeheerders
4. **Het betrekken van stakeholders:** Het inventariseren van de stakeholderwensen en het meenemen van deze wensen voor beheertaken en –beslissingen.

Een verdere specificering van de verantwoordelijkheden en taken is te vinden in de bijlage.

A4.4.2 Arrangement Explanation

De publieke private arrangementen zoals geformuleerd in het onderzoek kennen in totaal 14 elementen. De elementen vormen de bouwblokken van het arrangement. De elementen gezamenlijk beschrijven dus het arrangement. Een arrangement zal voor elk element een bepaalde waarde aannemen. Bestaande publiek private arrangementen zoals een DBFM, kunnen weergegeven worden op alle spectra. De elementen worden hieronder één voor één uitgelegd.

Number of participating parties (element 1.1)

Het totale aantal partijen dat onderdeel uitmaakt van het arrangement (overeenkomst) inclusief opdrachtgever. Bedraagt dus minimaal 2. De bovengrens is op 20 gezet.

Ratio public – private participation (element 1.2)

De numerieke verhouding publiek – privaat als afgeleide van element 1.1

Relative (power) position public – private party (element 2.1)

Relatieve machtsverhouding tussen opdrachtgever en opdrachtnemers. Drie mogelijke waardes:

- a. **Public hierarchy:** de publieke opdrachtgever legt het einddoel (prestatie/resultaten) van de overeenkomst eenzijdig vast legt en de formele bevoegdheid heeft om dit te bepalen / wijzigen. Formele vaststelling van rollen en verantwoordelijkheden tussen opdrachtgever en opdrachtnemer met betrekking tot het behalen en bepalen van het eindresultaat.
- b. **Semi - hierarchy:** Formele vastlegging van bevoegdheden tussen opdrachtgever en opdrachtnemer op hoofdlijnen, waaronder procedures voor het tussentijds evalueren van prestatie en bijsturen indien mogelijk, maar formaliteit beperkt tot het noodzakelijke.
- c. **Equality:** volledig gelijkwaardige machtsverhouding tussen opdrachtgever en opdrachtnemer met volledig gezamenlijke verantwoordelijkheid, waarbij partijen gemeenschappelijk het doel van de overeenkomst bepalen en verder vorm geven. Geen formele bevoegdheidsverdeling.

Type and degree of coordination and interaction (element 2.2)

De mate en hoeveelheid van coördinatie en interactie kent de volgende vijf waardes, waarbij coördinatie staat voor het afstemmen van de beheeractiviteiten in lijn met het doel van de overeenkomst (samenwerking) en interactie voor de informatie-uitwisseling tussen deelnemende partijen :

- a. **No coordination and interaction:** geen coördinatie en interactie tussen opdrachtgever en opdrachtnemer
- b. **Informal infrequent:** geen formele vastlegging van interactie en coördinatie momenten. Interactie en coördinatie vindt ad hoc plaats met een relatief lage frequentie (2 keer per jaar of minder).
- c. **Informal frequent:** geen formele vastlegging van interactie en coördinatie, maar wel relatief hoge frequentie (2 keer per jaar of meer).
- d. **Formal infrequent:** Formele vastlegging van afstemming en interactie, bijvoorbeeld vaste overlegmomenten of evaluatiemomenten. Relatief lage interactie- en coördinatiefrequentie (2 keer per jaar of minder).
- e. **Formal frequent:** Formele vastlegging van afstemming en interactie, bijvoorbeeld door middel van vaste overleg- en/of evaluatiemomenten, Relatief hoge interactie- en coördinatiefrequentie (meer dan 2 keer per jaar)

Degree of organizational fusion (public – private) (element 2.3)

De mate van organisatorische fusie bevat drie mogelijke waarden:

- a. **Fully independent:** opdrachtgever en opdrachtnemer zijn strikt gescheiden entiteiten
- b. **Independent, shared resources:** opdrachtgever en opdrachtnemer blijven gescheiden entiteiten, maar leggen gezamenlijk resources in (geld, kennis) waarover zij gezamenlijke beslissingsbevoegdheid hebben.
- c. **Fully merged:** volledige fusie tussen opdrachtgever en opdrachtnemer, waarbij over alle beschikbare middelen binnen de organisatie gezamenlijke beslissingsbevoegdheid geldt.

Type of agreement (element 3.1)

Het type arrangement kent vier mogelijke waarden.

- a. **No agreement**: samenwerking gebeurt 'ad hoc' zonder dat er iets is afgesproken of vastgelegd is.
- b. **Fully informal agreement**: Volledig informele vastlegging van verdeling van verantwoordelijkheden, rechten en plichten en doel van de samenwerking. Informeel betekent op hoofdlijnen met mogelijkheid tot wijziging. Bijvoorbeeld: functionele prestatie-eisen die naar verloop van tijd verder ingevuld worden.
- c. **Partly informal agreement**: Gedeeltelijk formele vastgelegde verdeling van verantwoordelijkheden, rechten en plichten en doel van de samenwerking, zoals bijvoorbeeld bedienprocedures van stuwen en formeel vastgelegde prestatie-eisen.
- d. **Fully formal agreement**: Verdeling van verantwoordelijkheden, rechten en plichten en doel van de samenwerking tot in detail die gedurende de gehele looptijd van het arrangement vaststaan.

Degree of formal resource allocation (element 3.2)

De mate van formele toewijzing (inbreng) van resources (geld, kennis etc.) kent drie waarden:

- a. **No formal allocation**: geen formele toewijzing
- b. **Partly formalized**: Gedeeltelijk formele toewijzing, dat is op hoofdlijnen (nader in te vullen)
- c. **Fully formalized**: Volledig formeel vastgelegd, tot in detail.

Agreement duration (element 4.1)

De looptijd vanaf het begin van de overeenkomst kent vijf waarden:

- a. **Short (closed)**: Minder dan 10 jaar en vaststaand
- b. **Short (medium optional)**: aanvankelijk minder dan 10 jaar, maar met een optie tot verlenging naar 30 jaar
- c. **Medium (long optional)**: aanvankelijk 10 – 30 jaar, met een optie tot verlenging naar 50 jaar
- d. **Long (+ extension)**: aanvankelijk 50 jaar met mogelijke verlenging tot onbepaalde tijd
- e. **Fully open ended**: voor onbepaalde tijd

Purpose (result/product) (element 4.2)

Het doel van de samenwerking, dat is het eindresultaat, ofwel het eindproduct, al dan niet tastbaar, zoals geformuleerd aan het begin van de samenwerking, kent drie waarden:

- a. **Well defined**: Volledig, tot in detail geformuleerd
- b. **Half defined**: gedefinieerd op hoofdlijnen, bijvoorbeeld in de vorm van (abstracte) prestatiedoelen, invulling nader te bepalen
- c. **Open ended**: volledig open

Scope (intervention activities) (element 4.3)

De scope omschrijft de bepaling en verdeling van beheertaken (onderhoud, aanleg, vervanging, ontwerp) tussen de deelnemers van het arrangement aan het begin van de samenwerking en kent de volgende waarden:

- a. **Well defined**: heldere verdeling tot in de details vastgelegd en vaststaand
- b. **Half defined**: verdeling op hoofdtaken, nadere invulling vrij te bepalen
- c. **Ill defined**: Volledig open

Flexibility of arrangement (element 4.4)

De flexibiliteit van het arrangement beschrijft de mate waarin de looptijd, doel en scope van het arrangement tijdens het arrangement kunnen wijzigen. Drie mogelijke waarden:

- a. **Non – flexible**: volledig vaststaand van begin tot eind
- b. **Partly flexible**: aanpasbaar op gezette tijden en indien nodig bijvoorbeeld elke 5 jaar
- c. **Fully flexible**: op elk moment aanpasbaar

Reward distribution (public – private) (element 5.1)

Verdeling van eventuele kostenbesparing ten opzichte van wat aanvankelijk begroot was:

- a. **Limited individual**: van tevoren vaststaand, ongelijke verdeling tussen deelnemers
- b. **Limited shared**: vaststaand, gelijke verdeling tussen deelnemers
- c. **Unlimited shared**: variabel (gekoppeld aan prestatie), gelijke verdeling tussen deelnemers
- d. **Unlimited individual**: variabel (gekoppeld aan prestatie), ongelijke verdeling tussen deelnemers

Resource allocation distribution (element 5.2)

De verdeling van eventuele meerkosten ten opzichte van wat aanvankelijk begroot was tussen deelnemers:

- a. **Limited individual**: van tevoren vaststaand, ongelijke verdeling
- b. **Limited shared**: vaststaand, gelijke verdeling
- c. **Unlimited shared**: variabel (gekoppeld aan prestatie), gelijke verdeling
- d. **Unlimited individual**: variabel (gekoppeld aan prestatie), ongelijke verdeling

Decision making division (element 5.3)

Verdeling van beslissingsbevoegdheid gedurende de looptijd van de overeenkomst tussen deelnemers. Beslissingen relateren aan de beheeractiviteiten (onderhoud, aanleg, vervanging, ontwerp):

- a. **Egalitarian, negotiated**: gelijkwaardige verdeling tussen deelnemers. Besluiten gericht op het eigen belang van de beslisser(s)
- b. **Egalitarian, coordinated**: gelijkwaardige verdeling tussen deelnemers. Besluiten gericht op het gezamenlijke belang van de beslisser(s)
- c. **Hierarchical, coordinated**: ongelijkwaardige verdeling tussen deelnemers. Besluiten gericht op het gezamenlijke belang van de beslisser(s)
- d. **Hierarchical, negotiated**: ongelijkwaardige verdeling tussen deelnemers. Besluiten gericht op het eigen belang van de beslisser(s)

A4.4.3 Alternative description

Alternative 1: Task alternative 2 + Arrangement Waltje

In dit alternatief beslaat het arrangement de opdrachtgever Rijkswaterstaat (public client) en één private contractant die verantwoordelijkheid is voor het reilen en zeilen van het netwerk (element 1.1). De contractant is verantwoordelijk voor het identificeren van de wensen van de stakeholders en de medebeheerders bij de vervanging van de objecten. Daarnaast beslist de contractant over welke wensen wel en welke niet meegenomen worden en stemt hij zijn beheeractiviteiten af met de medebeheerders in het netwerk. Het beslissen over het vervangingsmoment, de vervangingsstrategie en de prioritering wordt zoveel mogelijk overgelaten aan de contractant, maar de opdrachtgever heeft een doorslaggevende stem en zal daarbij rekening houden met de afstemming met andere netwerken (element 2.1). Daarin weegt het publieke belang het zwaarst (element 5.3). De verantwoordelijkheid voor het ontwerp van de nieuwe objecten ligt wel bij de contractant. De opdrachtgever bepaalt de acceptabele risicowaarden en vertaalt deze naar prestatiedoelen. Gewenste prestatie van het netwerk wordt geformuleerd door de opdrachtgever die ze vertaalt naar prestatiedoelen. De vertaling naar de prestatie voor objecten is echter een taak voor de contractant. De contractant meet en evalueert tevens de netwerk – en objectprestaties. Het verzamelen van data om de netwerkprestatie aan te leveren is een taak voor de contractant, maar wel binnen de kaders van de opdrachtgever, aangezien die de verantwoordelijkheid draagt de prestaties van het netwerk te integreren met andere netwerken. De opdrachtgever bepaalt tevens het beschikbare investeringsbudget. Het vaststellen van de onderhoudsbehoefte en het uitvoeren van onderhoud doet de contractant. Als opdrachtgever bepaalt Rijkswaterstaat de impact van externe factoren op de prestatie van het netwerk en die van omliggende netwerken en verwerkt die voor het ‘interne netwerk’ in de aansturing naar de marktpartij. In de overeenkomst tussen opdrachtgever en opdrachtnemer liggen de te behalen prestatienormen en –doelen formeel vast (element 3.1), maar de opdrachtnemer heeft zelf de vrijheid hoe hij deze doelen haalt. Dat betekent dat hij daarin ook de vrijheid krijgt om de vervangingsstrategie en de ontwerpen vorm te geven (element 4.2), zolang de opdrachtgever daar maar mee instemt. De details zullen dus pas in de loop van de tijd uitgewerkt worden. De scope, looptijd van de overeenkomst en het eindresultaat kunnen op elk gewenst moment

aangepast worden, mits beide partijen instemmen (element 4.4). De verdeling van verantwoordelijkheid van beheertaken is wel strikt vastgelegd aan het begin van de overeenkomst (element 4.3).

Het arrangement heeft een looptijd voor onbepaalde tijd (element 4.1). Op gezette tijden (+/- 2 maal per jaar) overleggen opdrachtgever en opdrachtnemer formeel. De rest van de coördinatie en interactie is zoveel mogelijk formeel geregeld (element 2.2). Tijdens de formele overlegmomenten worden de risico's besproken alsmede het vervangingsmoment, richtlijnen voor het ontwerp en de prestatie van de contractant zal geëvalueerd worden. Er is een gezamenlijk budget, maar opdrachtgever en –nemer besluiten voornamelijk zelf over de middelen die ze inbrengen (element 2.3). De inbreng van resources ligt op hoofdlijnen vast, voldoende om zowel opdrachtgever als opdrachtnemer overtuigd te kunnen laten zijn dat de gestelde prestatiedoelen haalbaar zijn (element 3.2).

Eventuele kostenbesparingen zijn gekoppeld aan prestatie en gelijkwaardig verdeelt tussen opdrachtgever en opdrachtnemer (element 5.1). De opdrachtgever zal de aanlegkosten financieren, maar eventuele meerkosten kunnen toegerekend worden aan de opdrachtnemer in geval van slecht presteren (element 5.2).

Alternatief 2: Task alternative 3c + Arrangement van Hengel

In dit alternatief nemen 6-7 partijen deel, waarvan één opdrachtgever (Rijkswaterstaat), één contractant en 4-5 stakeholders/lokale beheerders (element 1.1). Alle deelnemers aan het arrangement hebben een gelijkwaardige bevoegdheid om het doel van de samenwerking en de verdeling van rechten, plichten en verantwoordelijkheden aan het begin van het arrangement vorm te geven (element 2.1). De verdeling van beheertaken ligt echter open en dient vooral door onderlinge afstemming bepaald te worden (element 4.3). De besluitvorming over de beheertaken is gelijkwaardig verdeeld onder de deelnemers (element 5.3). Overlegmomenten zijn gedurende de samenwerking formeel vastgelegd en zullen frequent plaatsvinden (element 2.2). Het doel van de samenwerking dient te worden vastgelegd (element 3.1), zei het wat meer informeel. Daarbij dient ook gelijk een globale verdeling van de inbreng van middelen te worden gemaakt (element 3.2).

De beoogde netwerkprestatie wordt gezamenlijk opgesteld, maar de opdrachtgever zal een doorslaggevende stem hebben. De beoogde prestatie van de contractant wordt gedetailleerd beschreven (element 4.2). De contractant meet de prestatie van het netwerk en voert daarmee ook een evaluerende taak uit. De contractant bepaalt ook het investeringsbudget voor het areaal. Volledige verantwoordelijkheid voor het identificeren van de onderhoudsbehoefte en het uitvoeren van het onderhoud gebeurt volledig door de contractant. Evaluatie van onderhoudswerkzaamheden vindt plaats op grond van de gestelde prestatiedoelen. De bepaling van het vervangingsmoment en de vervangingsstrategie ligt voornamelijk bij de contractant, waarbij de contractant ook de wensen van de stakeholders en medebeheerders meeneemt. Hij wordt daardoor gestimuleerd door prestatiedoelen die de opdrachtgever formuleert en evalueert. Het bepalen van acceptabele risicowaarden is een taak voor de opdrachtgever die ook gelijk de vertaling maakt naar aansturing op prestatiedoelen richting contractant. Identificeren van externe factoren en hun invloed op de netwerkprestatie vindt plaats door de contractant. Indien de externe factoren dermate grote, negatieve impact hebben die aan het begin van de samenwerking niet voorzien was, bestaat de mogelijkheid om aanpassingen van prestatiedoelen te maken. Elke 10 jaar is er de mogelijkheid om aanpassingen te doen aan de prestatie eisen, looptijd van de samenwerking en de verdeling van beheertaken (element 4.4). Echter, initieel dient de duur van de overeenkomst voor minimaal 50 jaar vast te staan (element 4.1).

De verdeling van opbrengsten is gekoppeld aan prestatie en overeenkomstig het ingelegde belang van de partij in kwestie (element 5.1). Hetzelfde geldt voor het vergoeden van extra kosten (element 5.2). Indien de contractant voordelen kan behalen door de inrichting van zijn beheertaken omtrent onderhoud, aanleg en vervanging af te stemmen met beheerders van omliggende netwerken en daar voordeel uit te halen, dan komt een groot gedeelte daarvan bij hem ten goede. Resources worden gezamenlijk ingebracht en de besluitvorming over de besteding van de resources is gelijkwaardig verdeeld (element 2.3).

Alternatief 3: Taak alternatief 3b en Arrangement de Jong

In dit alternatief bestaat het arrangement uit de opdrachtgever Rijkswaterstaat en meerdere contractanten (2-4). (element 1.1). Als eigenaar van de objecten en beheerder van het netwerk bepaalt de opdrachtgever de netwerkprestaties en doet dat zodanig dat de prestatie van het netwerk in kwestie is afgestemd met andere, omliggende netwerken. Deze netwerkdoelen zijn tevens de enige prestatie-eisen die met de contracten worden afgesproken (element 4.2). De contractanten monitoren de prestaties van de objecten en het netwerk zelf, inclusief de technieken die zij daarvoor wenselijk achten. Het investeringsbudget voor de vervangingsstrategie voor het hele areaal wordt gezamenlijk met de opdrachtgever bepaalt. De contractanten stellen vast, terwijl de opdrachtgever in benodigde informatie over het netwerk en de objecten voorziet. De contracten hebben wel zelf de verantwoordelijkheid om de onderhoudsbehoefte te bepalen, onderhoud uit te voeren en te evalueren, en het onderhoudsbudget te bepalen. Het bepalen van de externe factoren en impact daarvan gebeurt gezamenlijk, waarbij de contracten vooral de technische factoren voor hun rekening nemen, terwijl de opdrachtgever dat doet voor wetgeving en conjuncturele factoren. Op grond van deze analyses worden de risico's gezamenlijk ingeschat en verdeeld. Voor overige risico's geldt hetzelfde.

Tot aan het detailontwerp van de objecten zal er gezamenlijke beslissingsbevoegdheid over de ingebrachte resources gelden, daarna is het voor eigen verantwoordelijkheid (element 2.3). De beschikbare resources dienen globaal (op hoofdlijnen) vast te staan (element 3.2). Inbreng van kennis en financiën van 'buiten' het arrangement dient vanaf het begin af aan afgestemd te worden. De opdrachtgever heeft wel een doorslaggevende stem in het beslissen over de vervangingsstrategie en investeringsbudget (element 2.1). Coördinatie en interactie blijft zo formeel mogelijk en vindt vaak plaats (element 2.2).

Het inventariseren van stakeholderwensen zal voornamelijk door de contracten gedaan worden. De eindverantwoordelijkheid en prioritering blijft bij de opdrachtgever. Hetzelfde geldt voor het in kaart brengen van de wensen van de medebeheerders en de afstemming van beheeractiviteiten.

De overeenkomst zal op hoofdlijnen vaststaan, waarbij wel duidelijke afspraken gemaakt worden over het ter beschikking stellen van cruciale areaalinformatie door de opdrachtgever (element 3.1). De looptijd van de overeenkomst zal 10 – 30 jaar bedragen (element 4.1). De verdeling van beheeractiviteiten dient in onderling overleg bepaald te worden (element 4.3) en zal op gezette momenten aangepast worden indien nodig geacht wordt. Dat zelfde geldt voor de afspraken over de prestatiedoelen tussen opdrachtgever en contractanten (element 4.4).

Eventuele kostenbesparingen ten opzichte van oorspronkelijk ingeschatte budget worden gelijkwaardig verdeeld en gekoppeld aan prestatie (element 5.1). Opdrachtgever en contracten dragen gemeenschappelijk bij aan meerkosten (element 5.2). De verdeling van beslissingsbevoegdheid over de uit te voeren beheeractiviteiten is verdeeld naar inbreng van resources en risicoverdeling (element 5.3).

A4.4.4 Bijlage

De verdere specificering van de taken luidt als volgt:

1. Externe coördinatie (EC)

1. Formuleren van lange termijn prestatiedoelen voor en tussen (hele) netwerken (EC1)
2. Formuleren van lange termijn investeringen om de beoogde prestatiedoelen te halen (EC2)
3. Voorspellen van lange termijn ontwikkelingen en externe factoren inclusief impact assessment (EC3)
4. Vertalen van lange termijn inter-netwerk doelen naar netwerkspecifieke doelen (EC4)
5. Formuleren van data collectie strategie voor het netwerk (EC6)

2. Interne coördinatie (IC)

1. Het formuleren van prestatiedoelen en eisen voor het netwerk (IC1)
2. Het meten van de prestatie van het netwerk en de objecten (IC2)
3. Het vaststellen, bepalen en besluiten van het investeringsbudget voor het areaal op grond van de beoogde prestatiedoelen (IC3)
4. Het identificeren, plannen, evalueren van onderhoud voor de objecten op grond van de prestatiedoelen (IC4)
5. Het bepalen van het vervangingsmoment en formuleren van de vervangingsstrategie (IC5)
6. Het inventariseren van externe factoren¹³⁷ en de impact daarvan op het netwerk en netwerkprestatie (IC6)
7. Het formuleren van acceptabele risicowaarden en risiconiveaus en deze meenemen in de besluitvorming en beheer van de objecten en het netwerk.
8. Het inrichten van het proces om de juiste data en gegevens te kunnen generen om de prestatie te meten en te evalueren.

3. Synchronisatie (SI)

1. Het inventariseren van wensen van medebeheerders en deze meenemen in de besluitvorming (S1)
2. Het afstemmen van activiteiten met de medebeheerders (op grond van hun wensen) (S2)

4. Betrekken van stakeholders (S)

1. Het inventariseren van wensen van medebeheerders en deze meenemen in de besluitvorming (SI1)

¹³⁷ Externe factoren zijn alle factoren die invloed uitoefenen op het prestatie van het netwerk, maar die niet beïnvloed kunnen worden door de beheerder van het netwerk. Voorbeelden zijn de ontwikkeling van scheepvaartvolumes of waterhoogtes.

A4.4.5 Evaluation forms

Alternative evaluation form

Beoordeel het alternatief op de verwachte effecten op de volgende criteria:

1) Kosten: totale beheerkosten inclusief vervanging; 2) Innovatie: mate waarin innovatie gerealiseerd wordt; 3) Kwaliteit: mate waarin de netwerkdoelen behaald worden.

Vul daarbij één van de onderstaande waardes in:

- sterke verslechtering t.o.v. huidige arrangementen en rolverdeling publiek - privaat
- gematigde verslechtering t.o.v. huidige arrangementen en rolverdeling publiek - privaat
- +/- geen verandering t.o.v. huidige arrangementen en rolverdeling publiek - privaat;
- + gematigde verbetering t.o.v. huidige arrangementen en rolverdeling publiek - privaat
- ++ sterke verbetering t.o.v. huidige arrangementen en rolverdeling publiek - privaat

Criterium	Score	Toelichting
Kosten		
Innovatie		
Kwaliteit		

:

Voting Billet form

In de tabel hieronder kunt u uw voorkeursalternatief invullen inclusief verwachte score op de criteria kosten, innovatie en kwaliteit. Daarbij kunt u kiezen uit de volgende scores:

- sterke verslechtering t.o.v. huidige arrangementen en rolverdeling publiek - privaat
- gematigde verslechtering t.o.v. huidige arrangementen en rolverdeling publiek - privaat
- +/- geen verandering t.o.v. huidige arrangementen en rolverdeling publiek - privaat;
- + gematigde verbetering t.o.v. huidige arrangementen en rolverdeling publiek - privaat
- ++ sterke verbetering t.o.v. huidige arrangementen en rolverdeling publiek - privaat

Voorkeursalternatief (vul alternatief nummer in)	Kosten	Innovatie	Kwaliteit

Vul hieronder a.u.b. de toelichting in

Appendix 5 Relation between arrangement elements

This appendix provides an overview of the relations between element values. These relations were initially used to design preliminary arrangement alternatives (see chapter 5).

A5.1 Relation between the elements.

Governance strategies can be used to describe public private relations (in an agreement)(Lenferink et al., 2013a). In general three models can be distinguished: hierarchy, network and competition (Leendertse & Arts, 2013; Lenferink, 2013). These are described in table A5.1, below.

Table A5.1 Overview of governance mechanisms (based on Leendertse & Arts,2013; Lenferink,2013)

	Hierarchy	Market	Network
Governance strategy	Coordination	Competition	Cooperation
Aim	Lowest cost	Making profit	Knowledge development
Relation between parties	Hierarchical (principle – agent)	Independent	Interdependent
Type of interaction	Contractual	Negotiation	Dialogue
Driving mechanisms	Power (authority)	Rent seeking behaviour	Quality (joint interests)
Core element(s)	Low price	Price / quality	Mutual trust
Advantages	Cost efficiency, structured and stable process	Flexibility, variety, cost efficiency	Increased quality
Disadvantages	‘Stifling’ process	Dominant focus on cost efficiency	Long processes, lack of transparency
Example	Traditional procurement	Competitive tendering	Alliance / Partnership

A close examination of the description of the governance mechanisms reveals certain patterns. That is, the characteristics are coherent and seem to reinforce each other or just seem to exclude each other. If one compares the *type of interaction* with *relation between parties* for example, this relationship becomes clear. A dialogue type of interaction does not suit a hierarchical principle agent relationship. The patterns thus indicate that some elements may be interrelated. These interrelations provide a good starting point for coherent and feasible arrangements that are suitable for strategic infrastructure replacement.

From table A3.1 a few patterns become clear. Firstly, publicly dominated arrangements favour hierarchical (top down) steering with a closed focus with regard to scope, result and duration. There is limited flexibility and coordination and no joint decision making. The more the number of participants increases and the more open the cooperation is, the more loose the cooperation steering, and the more coordination is possible. One has to keep in mind that it is not possible to derive causal relations from the table above. Nevertheless, the patterns can provide valuable insights for creating coherent arrangements.

Based on the conclusions and findings from literature the following relations between the elements can be distinguished the following (sub-)elements are interrelated: Some elements even exclude each other. The *agreement type* serves as a good example. Transactional and relational agreements possess per definition characteristics that define them as such. For example, relational agreements are per definition open and flexible. The next section describes the interrelations between the (sub-)elements.

Number of participating parties and Degree of formality

The more parties are involved, the harder it will be to formalize the cooperation, especially when the ratio public private parties is privately dominant (private parties need to coordinate their activities).

Number of participating parties and type and degree of coordination and interaction

The larger the number of agreement participants, the harder it will be to formalize interactions and coordinate the joint activities towards the common interest (and purpose). On the other hand, some form of formalized coordination and interaction is required, in order to keep the arrangement aligned (Steijn et al., 2011).

Number of participating parties and Decision making distribution

The larger the number of agreement participants, the harder it will be to formalize and coordinate all decisions, such that the decisions are dependent, coordinated and egalitarian.

Relative power position public private and degree of formality

In case of power difference (resource power) between the parties, formality is likely to be apparent to safeguard the interests of all parties (Schaeffer & Loveridge, 2002). In general, the bigger the relative resource position difference the more importance will be given to formal relationships, that is formal (transactional) agreements and formal resource allocation. In the opposite situation, when power positions are (almost) equal, formality will play a less important role in the arrangement.

Relative power position public private and degree of organisational fusion

The less the difference in relative power position public private the easier it will be to 'merge', that is to become equal partners and thereby stimulate cooperation (Schaeffer & Loveridge, 2002).

Type and degree of coordination and interaction and degree of organizational fusion.

The degree to which participatory organizations are merged or independent will determine the interaction patterns between the participants. The higher the degree of organizational fusion, the more frequent coordination and interaction will be, and also more organic (Schaeffer & Loveridge, 2002).

Degree of formality and degree of flexibility and openness

The more formal the agreement, the less open and flexible the agreement will be. After all, a formal transactional agreement is by definition limited in scope, time and reward. On the other hand, a more relational type of agreement is characterized by its open ended scope, duration and flexibility. An essential characteristic of relational contracting is that the relationship duration is long (Ling et al., 2013) in order to build trust.

Degree of formality and organizational fusion

The less hierarchical the agreement is, the easier it will be to cooperate by means of organizational fusion, that is taking away the organizational boundaries (Schaeffer & Loveridge, 2002).

Type of agreement and type and degree of coordination and interaction

An informal agreement will go hand in hand with formalized and frequent interaction and coordination, since the scope of the agreement needs to be determined in mutual cooperation and by frequent interaction (Steijn et al., 2011). Information exchange is a very important element of interaction (W. Leendertse & Arts, 2013) and therefore for cooperation (and collaboration).

Type of agreement and degree of formal resource allocation

This relation is rather evident. The more formalized an agreement, the more formalized the degree of resource allocation and vice versa.

Reward distribution (public –private) and resource allocation distribution

The basis for each cooperation is a basis correlation between the amount of investment and the amount of (expected) reward (Becker & Patterson, 2005). Therefore this relation may be safely assumed.

Reward distribution (public – private) / resource allocation distribution and Decision making division

It can be assumed that the more the reward is distributed equally among the participants, the more the decision making division will be egalitarian and more dependent the decisions will be. Dependent means here that the participants will correlate their decision such that the decisions enforce each other in the achievement of the common interest (see for example (Becker & Patterson, 2005).

Decision making division and Degree of organizational fusion

The more the participating organizations are merged, the more decisions will be egalitarian, dependent and coordinated (Schaeffer & Loveridge, 2002).

Decision making division and Type and degree of coordination and interaction

Coordinated and dependent decisions among participants require formalized and frequent coordination and interaction, especially if the number of participants in the agreement are large (Klijn et al., 2008).

Decision making division and type of agreement

Decision making is part of the 'formality' of an arrangement and are therefore related. Hierarchical (transactional) arrangements will tend to independent decisions and limited coordination, while informal (relational) arrangements are characterised by dependent and coordinated decision making (Becker & Patterson, 2005).

All of the relations described above are visualized in Figure A3.1.

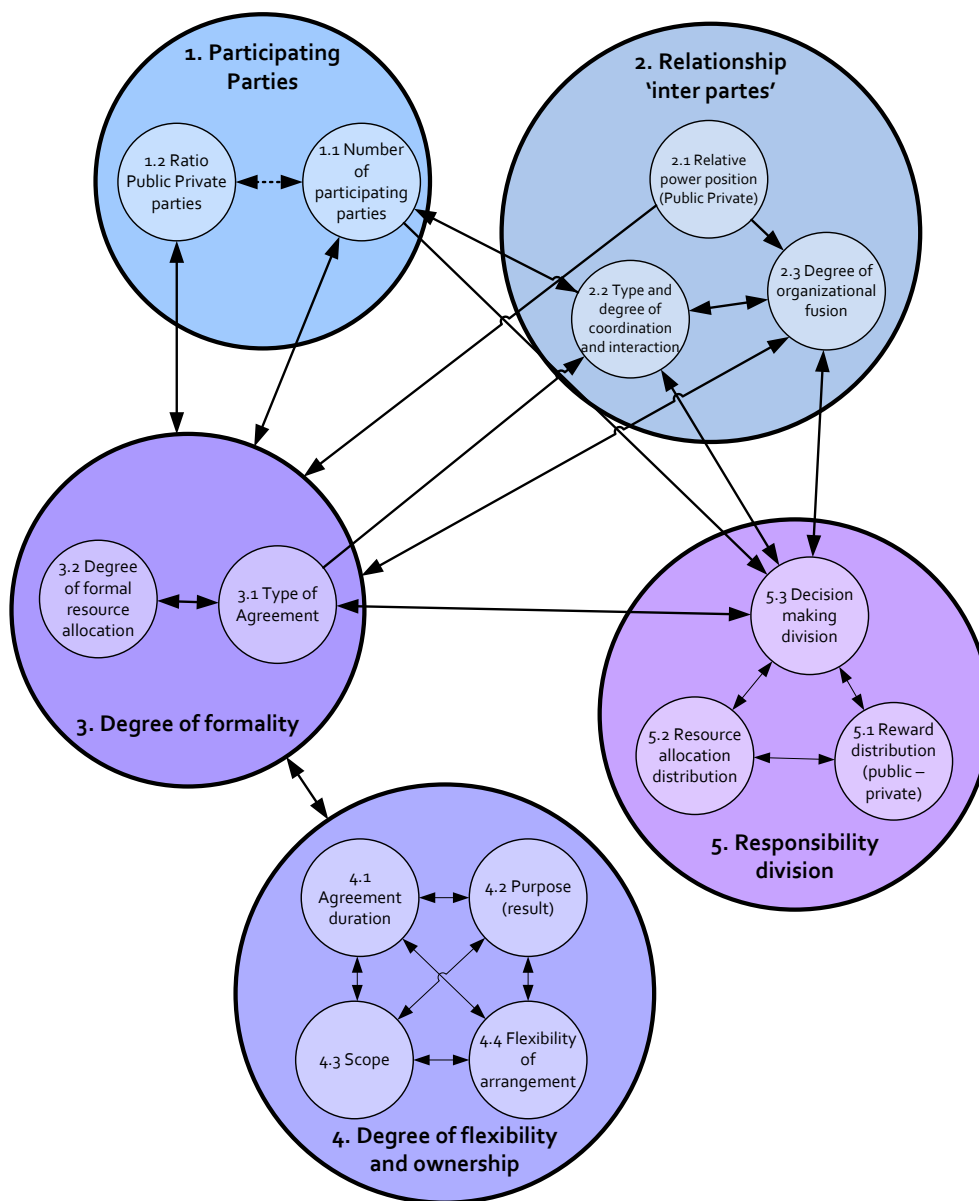


Figure A5.1 Visualization of element relations (developed by researcher)

Appendix 6 Task Alternative Arrangements

This appendix shows the preliminary arrangements based on the first round semi-structured interviews.

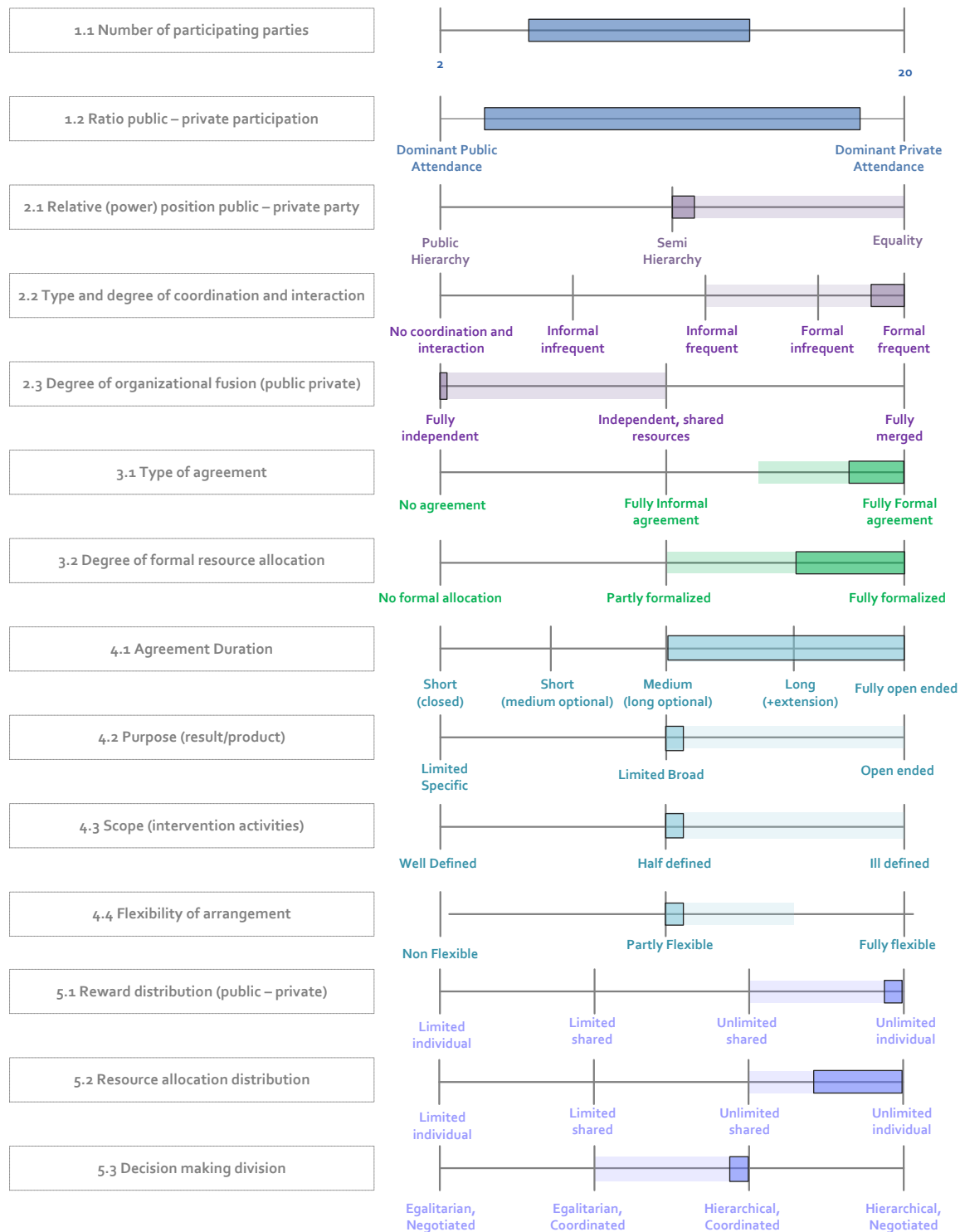


Figure A6.1 Overview of Arrangement Alternative 1

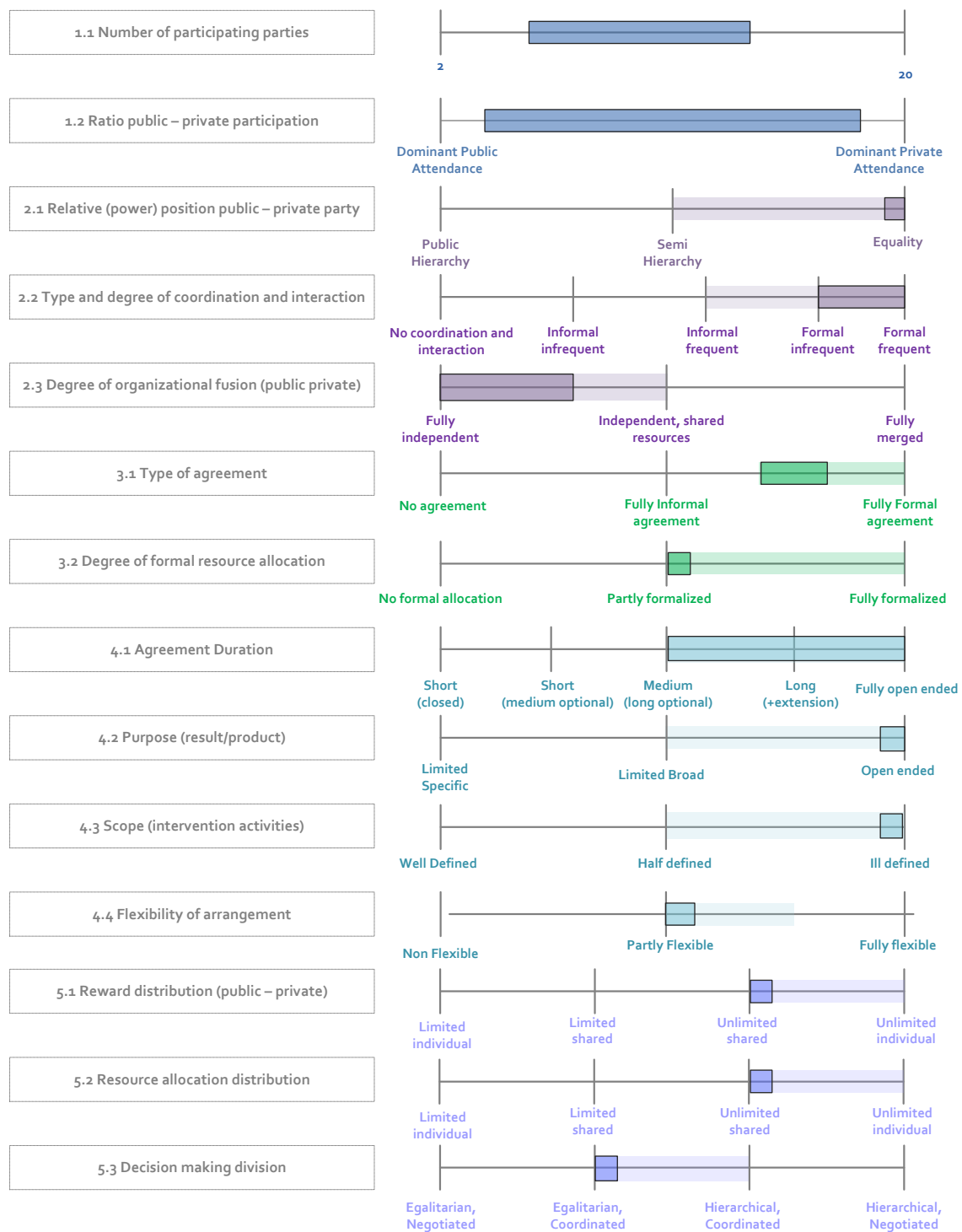


Figure A6.2 Overview of Arrangement Alternative 2

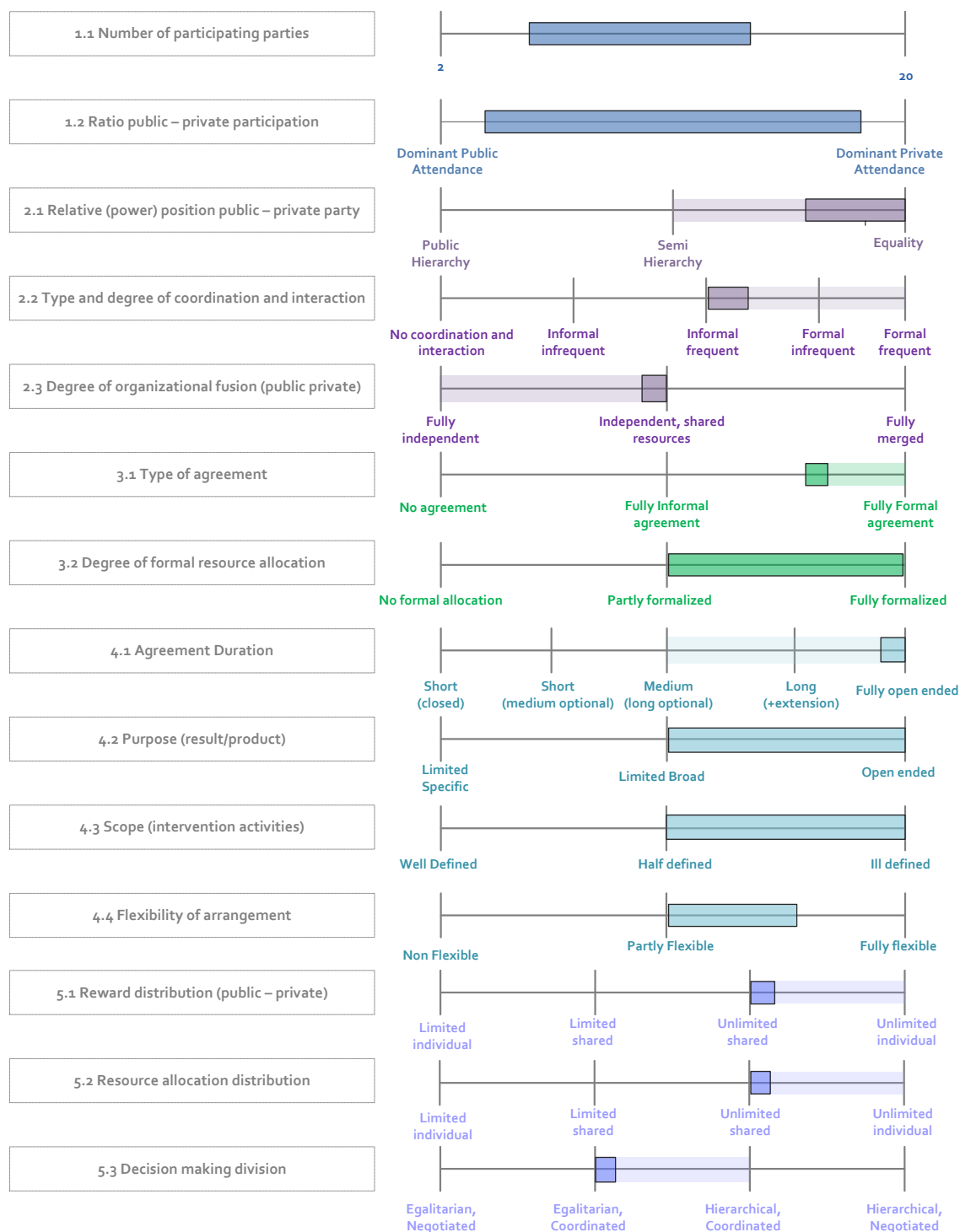


Figure A6.3 Overview of Arrangement Alternative 3

Appendix 7 Detailed explanation of Public-Private Task Division Case Study Stuwten Maas

By providing an overview of the underlying reasons behind the allocation of replacement tasks, table A.7.1 provides a rich picture on both public and private preferences on the task allocation. ¹³⁸

Table A.7.1 Overview of Public-private Task Allocation Preferences (Case Study)

Task description	ID	Public or Private?	Explanation	Respondent
Formuleren prestatiedoelen en -eisen voor het netwerk	IC1	Publiek	Netwerkprestatie is van maatschappelijk belang	Michon (PU)
		Publiek (Privaat)	Potentieel gevaar: conflicterende afweging belangen vergeleken met publiek	van Hengel (PU)
		Publiek	Opdrachtgever heeft als eigenaar object verantwoordelijkheid netwerkdoelen op te stellen, overeenkomstig maatschappelijk belang	Waltje (PR)
		Publiek (Privaat)	Het formuleren van doelen en prestaties en toekomstmogelijkheden (onderzoek) kan je uitbesteden (voorbereiding, Besluitvorming en vaststelling doelen altijd door overheid	Albrecht (PU)
		Publiek (Privaat)	Formulering is uiteindelijk een publieke taak. Markt kan invulling van prestatie doen: indeling van netwerk, uitwerking van prestatiedoelen en inrichting van het netwerk	De Jong (PR)
		Publiek (Privaat)	Vooraf een overheidstaak. Private partijen kunnen de prestatiedoelen definiëren en erover adviseren, maar overheid besluit	Van Vuren (PR)
Meten van prestatie van netwerk en objecten	IC2	Privaat	Private partijen kunnen dit, mits evaluatie en monitor variabelen maar eenduidig zijn.	Michon (PU)
		Privaat	Marktpartijen zorgen voor objectiviteit, terugkoppeling naar opdrachtgever belangrijk voor verbetering netwerk doelen en prestatie	Van Hengel (PU)
		Privaat	Meting en evaluatie dient onafhankelijk te zijn van formuleren doelen en prestaties	Waltje (PR)
		Privaat	Marktpartijen kunnen dit (effectief). Voorwaarde: OG moet toezien dat ON ook daadwerkelijk levert. Scherpe sturing vereist.	Albrecht (PU)
		Privaat	Een meting is goed te omschrijven: leent zich voor uitbesteding. Indien markt voldoende vrijheid krijgt kan het leiden tot creatieve oplossingen. Markt heel veel te bieden in snel veranderende wereld van monitoring	De Jong (PR)
		Privaat	“De controle hoeft niet bij de overheid te leggen. Private partijen kunnen dat doen en overleggen.”	Van Vuren (PR)
Vaststellen van investeringsbudget areaal	IC3	-	-	Michon (PU)
		Privaat	Voorwaarde: wel voldoende concurrentie nodig voor ‘fair’ aanbod	van Hengel (PU)
		Publiek (privaat)	Overheid bepaalt investeringsbudget voor areaal en moet dus ook bepalen wat toereikend is. Marktpartijen kunnen wel ondersteuning leveren	Waltje (PR)
		Publiek (privaat)	Investeringsbudget ligt bij overheid dus die besluit. Voorbereiding, zoals raming en onderbouwing kan privaat	Albrecht (PU)
		Publiek & Privaat	Deze taak moet vooral samen: samen verkennen en samen investeringsbudget vaststellen. Private partij kan veel doen, mits het alle relevante areaal informatie krijgt. Flexibiliteit in investeringen vereist	De Jong (PR)

¹³⁸ The explanations are directly adapted from the interview summaries. Since the interviews were held in Dutch and the summaries were written in Dutch, the explanation column is also written in Dutch.

		Publiek & Privaat	In samenspraak en onderlinge afstemming. Als je samen een traject in gaat moet je samen investeren.	
Identificeren, plannen en evalueren van onderhoud	IC4	Privaat (Publiek)	Kans (ontzorging), maar wel belangrijke rol voor opdrachtgever (sturing), evaluatie lastig, angst voor monopolist	Michon (PU)
		Privaat	Voorwaarde: prestatiedoelen moeten goed geformuleerd worden door opdrachtgever en bijpassende evaluatie (goed opdrachtgeverschap). Faciliteren 'leerproces' voor opdrachtgever	Van Hengel (PU)
		Privaat	Marktpartijen kunnen deze taak over het algemeen veel efficiënter uitvoeren dan de overheid. Streven naar zo klein mogelijke overheid	Waltje (PR)
		Privaat	Advies: scheid identificeren en plannen van evaluatie om kwaliteit te bewaken. Prestatiedoelen korte termijn gericht. Voorwaarde: OG stuurt aan op hoofdlijnen en moet proces kunnen overzien.	Albrecht (PU)
		Privaat & Publiek	Markt heeft veel kennis op dit gebied, maar publieke partij heeft veel areaal kennis. Samen optrekken is gewenst.	De Jong (PR)
		Privaat	De private partij kan het onderhoud afkopen en dient te zorgen dat de objecten binnen de afgesproken periode functioneel blijft en technisch blijft opereren zoals bedoeld	Van Vuren (PR)
Bepalen van vervangingsmoment & -strategie inclusief ontwerp	IC5	Privaat (Publiek)	Kans (ontzorging), maar wel belangrijke rol voor opdrachtgever (sturing), evaluatie lastig, angst voor monopolist	Michon (PU)
		Privaat	Voorwaarde: voldoende incentives voor markt om stakeholderwensen 'maximaal' te gebruiken.	van Hengel (PU)
		Publiek (Privaat)	Ontwerp dient los te staan van strategie en kan goed door de markt gedaan worden. Overheid bepaalt budget en dus ook vervangingsmoment & strategie	Waltje (PR)
		Publiek (Privaat)	Overheid bepaalt uiteindelijk. Private partijen kunnen assisteren bij formuleren strategie & vervangingsmoment. Ontwerp voornamelijk markt, mits randvoorwaarden uit strategie voldoende scherp.	Albrecht (PU)
		-	-	De Jong (PR)
		Publiek & Privaat	OG (RWS) vervult de rol van facilitator en voorziet in informatie en data van het areaal.	Van Vuren (PR)
Inventariseren externe factoren & impact	IC6	=	-	Michon (PU)
		Privaat	De markt heeft van nature een prikkel om externe factoren aan te kaarten bij opdrachtgever. Eindverantwoordelijkheid bij opdrachtgever. <u>Calculatie?</u>	Van Hengel (PU)
		Publiek	Overheid stelt infrastructuur ten dienste van samenleving en is dus verantwoordelijk	Waltje (PR)
		Privaat	Voldoende kennis bij markt, geen rol voor overheid nodig	Albrecht (PU)
		Publiek & Privaat	Technische factoren door markt, conjunctuurgevoelige en wetgevingsgerelateerde factoren door overheid	De Jong (PR)
		Publiek (Privaat)	Zwaartepunt ligt bij overheid. Impact bepalen kan gezamenlijk, maar overheid moet één lijn trekken bij bepalen van de ontwikkelingen van externe trends voor zijn infrastructuur (netwerkovertijgend)	Van Vuren (PR)
Formuleren van acceptabele risicowaarden + besluitvorming	IC7	-	-	Michon (PU)
		Publiek	Valt onder maatschappelijke verantwoordelijkheid. Risicoprofiel vaststellen overeenkomstig maatschappelijk optimum en doorvertalen naar objectniveau	Van Hengel (PU)
		Publiek	Eindverantwoordelijkheid bij de overheid, want het gaat om "ingrijpende zaken"	Waltje (PR)
		Publiek (Privaat)	Besluitvorming bij overheid. Operationele beslissingen bij ON, mits voldoende rugdekking en vertrouwen door OG open dialoog over risicoverdeling	Albrecht (PU)
		Publiek & Privaat	Private partij is in staat om zelf risico's in te schatten. Meest ideaal als ON en OG het samen doen in een soort alliantievom.	De Jong (PR)
		Publiek (Privaat)	Overheid is eindverantwoordelijke, maar kan wel samen met marktpartijen risicowaarden definiëren en erover besluiten	Van Vuren (PR)
Inrichten van data proces voor meten	IC8	-	-	Michon (PU)

prestatie		Privaat	“Dit is ‘doe-werk’”. Markt doet het beter, goedkoper en sneller dan overheid door concurrentieprikkels	Van Hengel (PU)
		Privaat	Vanuit het streven naar een zo klein mogelijke overheid	Waltje (PR)
		Privaat	De markt is hier goed toe in staat. Tot op heden geen negatieve gevolgen ondervonden	Albrecht (PU)
		Publiek / Privaat	Beide partijen kunnen deze taak op zich nemen. Verstandig om beheertaak in zelfde hand te leggen	De Jong (PR)
		Publiek (Privaat)	Overheid heeft eigen meetnetwerk tot beschikking. Echter bij toekomstige aanpassingen wordt de rol van private partijen belangrijker	Van Vuren (PR)
Formuleren lange termijn prestatiedoelen (inter)netwerk	EC1	-	-	Michon (PU)
		-	-	Van Hengel (PU)
		Publiek	Zie IC1	Waltje (PR)
		Publiek (Privaat)	Formuleren van lange termijn doelen altijd overheid, aanleveren beslisinformatie kan markt doen	Albrecht (PU)
		Publiek	Prestatie van systeem moet strikt gescheiden worden van andere systemen. Prestatie van Maas is afhankelijke van andere systemen waardoor het lastig is netwerk volledig privaat te laten beheren	De Jong (PR)
		Publiek (Privaat)	Zie IC1	Van Vuren (PR)
Formuleren lange termijn investeringen	EC2	-	-	Michon (PU)
		-	-	Van Hengel
		Publiek (Privaat)	Zie IC3	Waltje (PR)
		Publiek (Privaat)	Vaststellen door overheid, aanleveren beslisinformatie markt	Albrecht (PU)
		Publiek & Privaat	Zie IC3	De Jong (PR)
		Publiek & Privaat	Zie IC3	Van Vuren (PR)
Voorspellen lange termijn ontwikkelingen & factoren + impact	EC3	-	-	Michon (PU)
		-	-	Van Hengel (PU)
		Publiek	Zie IC6	Waltje (PR)
		Publiek (Privaat)	Beslissingsbevoegdheid bij overheid, maar identificeren van externe factoren, ontwikkeling en impact markt	Albrecht (PU)
		Publiek & Privaat	Zie IC6	De Jong (PR)
		Publiek (Privaat)	Zie IC6	Van Vuren (PR)
Vertalen van internetaanpak doelen naar netwerk specifieke doelen	EC4	-	-	Michon (PU)
		-	-	Van Hengel (PU)
		Privaat	Vanuit het streven naar een zo klein mogelijke overheid	Waltje (PR)
		Privaat	Voorwaarde: duidelijke contractuele afspraken m.b.t. beslissingsbevoegdheid en vrijheid ON	Albrecht (PU)
		Publiek	Zie EC1	De Jong (PR)
		Privaat	Zie IC2	Van Vuren (PR)
Formuleren van data collectie strategie internetaanpak	EC5	-	-	Michon (PU)
		-	-	Van Hengel (PU)
		Privaat	Zie IC8	Waltje (PR)
		Privaat	Geen besluitvorming nodig	Albrecht (PU)
		Privaat	Zie IC2	De Jong (PR)
		Publiek (Privaat)	Zie IC8	Van Vuren (PR)
Lange termijn capaciteitsplanning	EC6	-	-	Michon (PU)

tussen netwerken		-	-	Van Hengel (PU)
		Publiek	Zie IC1	Waltje (PR)
		Publiek (Privaat)	Inhoudelijk, technisch werk markt, besluitvorming overheid. Zeker gezien afhankelijkheid van beschikbare financiële middelen en noodzakelijke prioritering van doelen en prestatie	Albrecht (PU)
		Privaat	Zie IC2	De Jong (PR)
		Publiek & Privaat	Zie IC5	Van Vuren (PR)
Integreren van asset management data	EC7	-	-	Michon (PU)
		-	-	Van Hengel (PU)
		Publiek	Overheid is eigenaar dus verantwoordelijk	Waltje (PR)
		Privaat	Enige voorwaarde: uitbesteden geeft valide resultaat. Controle dus nodig	Albrecht (PU)
		Privaat	Zie IC2	De Jong (PR)
		Publiek (Privaat)	Zie IC8	Van Vuren (PR)
Inventariseren van stakeholderwensen + besluitvorming	SI1	-	-	Michon (PU)
		Publiek (Privaat)	Het inventariseren van wensen en onderhouden contacten is 'doe-werk', dus privaat, mits incentivized. Gezamenlijke definitie maatschappelijk optimum kan helpen. Besluit en afweging belangen is publiek.	Van Hengel (PU)
		Publiek (Privaat)	Het inventariseren kan door marktpartijen gedaan worden, maar besluitvorming moet door overheid	Waltje (PR)
		Publiek (Privaat)	Inventariseren uitbesteden, beslissing door overheid	Albrecht (PU)
		Publiek (Privaat)	Inventariseren en meenemen van wensen, omgevingsmanagement en stakeholder management is vooral een private taak, maar publieke partij zou het moeten blijven beheren. Belangrijk om één gezicht te hebben.	De Jong (PR)
		Publiek / Privaat	Private partijen kunnen inventarisatie doen. Het is wel de vraag of stakeholders hun eisen hetzelfde eisen als een private partij dit zou doen vergeleken met overheid.	Van Vuren (PR)
Inventariseren wensen medebeheerders + besluitvorming	S1	-	-	Michon (PU)
		Privaat	De markt moet hier goed toe in staat zijn	Van Hengel (PU)
		Privaat	Marktpartijen, want die zijn daar goed toe instaat	Waltje (PR)
		Publiek	Vooraf van belang is een goede samenwerkingsverband met medebeheerders en daarom lastig uit te besteden in verband met potentiële conflicten.	Albrecht (PU)
		Publiek (Privaat)	Zie SI1	De Jong (PR)
		Publiek & Privaat	In samenspraak. Deze categorie stakeholders is gewend met private partijen te praten. In principe kan veel dus naar de markt, maar daar moet wel een duidelijke keuze in gemaakt worden	Van Vuren (PR)
Afstemmen activiteiten met medebeheerders	S2	-	-	Michon (PU)
		Privaat	Kans op conflicten private beheerder met lokale medebeheerders. Voorwaarde: 'strategie conflictbeheersing'. Opdrachtgever als 'procesbewaker'	Van Hengel (PU)
		Privaat	Streven naar een zo klein mogelijke overheid	Waltje (PR)
		Publiek	Zie S1	Albrecht (PU)
		Publiek (Privaat)	Zie S1	De Jong (PR)
		Publiek & Privaat	Zie S1	Van Vuren (PR)

Note. IC = Internal Coordination; EC = External Coordination; SI = Stakeholder involvement; S = Synchronization; PR = Private; PU = Public. The Task ID numbers correspond with those displayed in table 15.

Appendix 8 Elaborate Task Alternative Evaluation Case Study

During the case study interviews the respondents evaluated the predefined task alternatives (see section 5.3). The results of the evaluation are summarized in table A8.1. The remaining part of this appendix shows the data underlying the alternative scores. Since all interviews were taken in Dutch, the results are given in Dutch.¹³⁹

Table A8.1 Overview of Respondent Alternative Score

Respondent	Alternative 1			Alternative 2			Alternative 3		
	C	Q	I	C	Q	I	C	Q	I
Michon	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Van Hengel	+/-	+/-	+/-	+	+	+	++	++	++
Waltje	+/-	++	+/-	++	++	++	-	+/-	+/-
Albrecht	+/-	+/-	+/-	+	+/-	+	++	++	++
De Jong	+/-	+/-	+/-	+/-	+/-	+/-	++	++	++
Van Vuren	+/-	+/-	+/-	++	++	++	+	+	+

Note. C = Costs; Q = Quality; I = Innovation; +/- = no improvement; += improvement; + big improvement; - = decrease; all compared to current situation

Michon

Niet van toepassing, alternatieven zijn niet voorgelegd.

Van Hengel

Alternatief 1

Dit is wat meer het traditionele, ouderwetse alternatief. De kosten zullen relatief hoog zijn, omdat er weinig ruimte voor concurrentie en innovatie is. De contractant is beperkt in zijn keuze vrijheid doordat de opdrachtgever al de oplossingsrichtingen inperkt om aan de wensen van de medebeheerders en stakeholders te voldoen. “De context is al hard gedefinieerd.” “De kwaliteit die je haalt is voorspelbaar.”

Alternatief 2

Dit alternatief laat meer spelruimte toe dan het eerste alternatief. Als opdrachtgever “laat je veel meer vrij”, maar wel met een zekere mate van controle. Op deze manier laat je ook veel meer innovatie toe, ook door de samenwerking met andere partijen. Hierdoor zullen de totale kosten omlaag gaan, en de kwaliteit omhoog. De externe communicatie zou in dit alternatief ook door de marktpartijen uitgevoerd kunnen worden, waarbij de publieke opdrachtgever wel evalueert, net zoals bij de stakeholders en medebeheerders. Het voordeel van het overhevelen van externe communicatie is dat er nog meer keuze vrijheid is voor de opdrachtnemer¹⁴⁰. Dit zal de kwaliteit¹⁴¹ verhogen.

Alternatief 3

Dit alternatief komt aardig in de buurt van de optimale situatie, waarbij het optimale maatschappelijke belang gediend wordt. De stakeholders worden gelijk betrokken en kunnen ook direct het gesprek voeren over de kosten. “Het is ook de beste manier om innovatie te stimuleren”, aangezien alles openligt. “Iedereen wil het meeste waar voor zijn geld hebben.” De vrijheden (chaos) zijn een trigger om met elkaar samen te werken. Ook voor dit alternatief geldt dat externe coördinatie door marktpartijen uitgevoerd zou kunnen worden.

Alternatief 3 wordt benoemd als ‘beste’ alternatief.

¹³⁹ Complete interview summaries are available on request by the author through sending an email

¹⁴⁰ Bijvoorbeeld: Een marktpartij kan besluiten om de stuwen weg te halen en in plaats daarvan alle schepen over de Rijn te sturen. Hij regelt dan zelf met de beheerder van de Rijn dat de Rijn geschikt gemaakt wordt om dit scheepvaartverkeer aan te kunnen en draagt bij in de vergoeding voor realisatie.

¹⁴¹ Kwaliteit is gedefinieerd als de mate waarin de opdrachtgever zijn netwerkdoelen haalt.

Waltje

Alternatief 1

Dit alternatief scoort naar verwachting het beste op kwaliteit. “Een marktpartij toch altijd heel sterk de neiging heeft om dingen zo goedkoop mogelijk te doen.” “Daar leidt de kwaliteit onder.” De overheid daarentegen is gedreven door “dingen zo goed mogelijk te doen ongeacht de kosten.” Omdat de verantwoordelijkheid voor het bepalen van de kwaliteit en de kosten in dit alternatief bij de overheid ligt, door het beslissen welke wensen van stakeholders en medebeheerders wel of niet mee te nemen scoort dit alternatief naar verwachting goed op kwaliteit, maar slecht op kosten. Het alternatief beperkt ook de innovatie doordat de marktpartij relatief weinig ruimte krijgt om te innoveren.

Alternatief 2

De totale kosten van dit alternatief zijn naar verwachting de laagste van de drie alternatieven, doordat zoveel mogelijk naar marktpartijen overgedragen wordt en zij daardoor de mogelijkheid hebben om hun taken efficiënt in te richten en uit te voeren. Ook dit alternatief scoort naar verwachting het beste op het gebied van innovatie. “Marktpartijen zijn over het algemeen innovatiever dan de overheid.” Dit alternatief stimuleert ook innovatie: “Als je maar veel, zoveel mogelijk bij een marktpartij neerlegt dan komt die innovatie vanzelf wel.” De ervaring met E&C contracten de afgelopen jaren heeft dit bewezen.

Alternatief 3

“Dit alternatief zie ik niet zo zitten.” Dit alternatief betreft stakeholders heel intensief bij de vervanging Stuwen Maas. De stakeholders hebben echter meer belangen dan alleen de vervangingsopgave. Er ontstaat dus een potentieel gevaar dat vertegenwoordigers van de stakeholder organisaties het belang van Stuwen Maas zwaarder laten wegen dan het belang van de eigen organisatie, en daarmee vervreemden van de eigen organisatie, hetgeen kan leiden tot interne conflicten. Bovendien leidt dit alternatief naar verwachting tot veel “overlegmomenten” en een “vergadercultuur”. Naar verwachting is dit alternatief dus niet zo efficiënt: “hoe groter de groep hoe minder efficiënt het wordt. Dan stijgen de kosten.” Ook gaat het ten koste van de innovatie: “Een grote groep werkt remmend op innovatiekracht.” Conclusie: “Je moet een beetje oppassen (..) met stakeholders heel erg nauw bij je eigen organisatie te betrekken.”

Alternatief 2 wordt benoemd als ‘beste’ alternatief.

Albrecht

Alternatief 1

Dit alternatief zal weinig innovatie uitlokken, alhoewel het daadwerkelijk effect van het contract zal afhangen. Dit geldt ook voor de kosten, risicoverdeling en kwaliteit. Het kwaliteitsniveau wordt waarschijnlijk wel gehaald bij dit alternatief.

Alternatief 2

Dit alternatief neemt een deel van de beheerslast uit handen. Dat kan, maar je betaalt er als opdrachtgever wel voor. “Wat ik ingewikkeld vind aan dit model is dat ik denk dat een gedeelte van de stakeholders zijn bedrijven, instellingen en weet ik veel wat en andere zijn medeoverheden, dan maakt het dan weer complex. Want met medeoverheden heb je vaak meer een publiek rechtelijke relatie dan een privaatrechtelijke relatie. Dat maakt het lastig in dit concept. Je kunt heel goed afstemmen allerlei dingen met de andere infra managers zoals je ze in dit concept heten, maar het is even de vraag of dat voor het hebben van vertrouwen en een bestendige relatie als opdrachtgever of dat dan de beste manier van opereren is” “Het kan best zijn dat als je het goed organiseert dat de totale kosten uiteindelijk lager zullen zijn aangezien je maar met één partij hoeft af te stemmen en te coördineren wat je doet.” Het kwaliteitsniveau zal naar verwachting goed gehaald worden bij dit alternatief, vergelijkbaar met alternatief 1. Dit alternatief leent zich om meer aan te sturen op ‘hoge’ doelen en daarmee de opdrachtgever meer vrijheid te geven, hetgeen innovatie kan bevorderen.

Alternatief 3

In theorie is dit het beste alternatief. In dit alternatief zitten de meest intelligente feedbackloops (interactie tussen partijen), dus in theorie zou het moeten zorgen voor de hoogste kwaliteit en laagste kosten, maar dit vereist aan de voorkant wel volledige overeenstemming over de prestatiedoelen. Qua innovatie heeft dit alternatief de grootste potentie. Het is wel lastig om in dit alternatief de contractuele relaties vast te leggen en overeenkomsten te maken (vastleggen): “Uiteindelijk leg je alle vormen van samenwerking vast in een contract of convenant, want het gaat niet alleen om het elkaar vertrouwen op blauwe ogen, maar uiteindelijk moet je ook dingen regelen voor het geval dingen niet zo gaan als je van te voren gedacht had.”

Alternatief 3 wordt benoemd als ‘beste’ alternatief.

De Jong

Alternatief 1

Dit alternatief scoort van de drie alternatieven het minst op innovatie, omdat de opdrachtgever al veel voorschrijft wat de contractant moet gaan doen. De exacte mate van innovatie zal afhangen van hoe het contract vorm gegeven wordt. Een functionele omschrijving van eisen kan stimulerend werken. Echter, “de publieke partij zal blijven toetsen op zijn bestaande kennisniveau.” Voor een complex vraagstuk als Stuwten Maas is het lastig om als opdrachtgever oplossingen voor te schrijven.

Alternatief 2

Innovatie zal in dit alternatief ook redelijk beperkt zijn omdat de opdrachtgever alsnog zal toetsen op grond van zijn eigen kaders en kennisniveau. Als kennisinstellingen die de normering opstellen vanaf het begin af aan al betrokken worden bij de innovatie en ook risico dragen, kan dit nadelige effect verminderd worden.

Alternatief 3

Dit alternatief haalt het beste uit innovatie, kosten, kwaliteit en “systeem mogelijkheden”, “omdat je elkaars kennis allemaal risicodragend gebruikt.” Maar ook “omdat je elkaar kunt uitdagen en omdat je een gemeenschappelijk belang hebt om naar de meest optimale oplossing te zoeken.” Hierdoor kunnen innovatieve oplossingen gerealiseerd worden die goedkoper zijn. Gezien de complexiteit van Stuwten Maas en de toekomstige onzekerheid is dit alternatief wenselijk omdat het zorgt dat opdrachtgever en –nemer gezamenlijk optrekken. Alle genoemde stakeholders zouden eigenlijk stakeholders moeten zijn als ze deel mogen nemen aan het arrangement. Om alle stakeholders in de alliantie te laten meedraaien wordt te onbeheersbaar, “een veelkoppig vehikel. En ik vraag me af of dat werkbaar is.” “Een alliantie is niet het tovermiddel om alle risico’s het beste te beheersen.” Door gezamenlijk de risico’s te identificeren, te berekenen en te verdelen kunnen lagere beheerskosten gerealiseerd worden. Dit voorkomt dat er onnodig risico’s in de gezamenlijke risicopot gestopt worden en onnodig afgeprijsd worden. Het is altijd nodig om kritisch te zijn over het verdelen van risico’s.¹⁴² Een alliantie biedt vooral voordelen als het gaat om risico’s waar beide partijen aan bij kunnen dragen, zowel financieel als in de beheersing. Dan ontstaat pas echt een optimale samenwerking.

Voor alle alternatieven geldt dat de exacte effecten vooral af zal hangen van de indeling van de samenwerking en het contract. Meer transparantie en meer openheid geeft automatisch een hogere prijskwaliteit verhouding.

Een variatie op alternatief 3 wordt bestempeld als beste alternatief. In dit alternatief bestaat het arrangement uit de contractant en de opdrachtgever. Beiden nemen risicodragend deel. Er is een gezamenlijke verantwoordelijkheid voor de afstemming met lokale beheerders en stakeholders. “De alliantie stemt met de stakeholders af of met de lokale beheerders.”¹⁴³

¹⁴² Het is onzinnig om een private partij voor 50% deel te laten nemen in een risico omtrent Europese Wetwijziging. Aan de andere kant heeft het weinig zin om een publieke partij deel te laten betalen als het slaan van palen uitloopt.

¹⁴³ Die afstemming kan ook in de vorm van een financiële bijdrage. Voorbeeld: Waterschappen dragen via een algemeen programma bij aan het Hoogwaterbeschermingsprogramma, waarbij ze voor 10% mee betalen in de kosten indien het hun areaal betreft. Dit voorkomt een “doet u mij maar” houding.

Van Vuren

Alternatief 1

Dit alternatief is heel erg traditioneel en zal naar verwachting minder scoren op kwaliteit, innovatie en kosten dan de andere twee alternatieven.

Alternatief 2

Dit alternatief “is een beetje het uiterste waarbij het gewicht komt te liggen bij de private partij. Dan denk ik als je de private partij gewoon wat meer vrijheid geeft dat dat innovatie en de prijs ten goede komt. Ik vind het heel moeilijk om te zeggen hoe het uitpakt richting kwaliteit en prestatie. Private partijen “letten doorgaans toch wel erg op hun centen.” De verwachting is dat de kosten mee zullen vallen, maar het is lastig te voorspellen. Innovaties dragen altijd het risico met zich mee duur uit te kunnen pakken.

Alternatief 3

Dit alternatief is de middenweg tussen alternatief 1 en 2 en leidt wellicht tot de beste prestatie. De overheid kan vanuit zijn traditionele rol aangeven wat het systeem moet kunnen. Die hebben vanuit hun beheerverleden ook veel ervaring met het systeem. De private partij kan de overheid ‘dwingen’ en stimuleren om buiten “de geëffende banen” te kijken.

Appendix 9 Overview of Case Study Respondent Arrangement formulations

During the case study interviews the respondents formulated arrangements by means of 'filling in' the arrangement framework (see section 3.2). The remaining part of this appendix shows the data underlying the element value preferences. Since all interviews were taken in Dutch, the results are given in Dutch.¹⁴⁴

Michon

Aantal betrokken partijen (1.1)

De respondent gaf in het interview diverse malen aan dat het gevaarlijk is om het beheer van het areaal aan één partij te gunnen. Er moeten altijd meerdere partijen betrokken zijn bij aanbesteding en beheer van areaal. Daarom is gekozen voor 3-5 partijen.

Numerieke Verhouding publiek – private deelname (1.2)

Het arrangement bestaat voor minimaal de helft uit private partijen, en is daarom meer 'privaat dominant' dan publiek dominant.

Relatieve machtspositie publieke – private partijen (2.1)

Gelijkwaardigheid van publiek en private partijen is wenselijk om gezamenlijk kennis te delen en in een vroeg stadium risico's in te schatten. Een zekere mate van publieke hiërarchie is echter ook wel wenselijk om de prestaties van de contractant te kunnen evalueren en af te rekenen. Vandaar de keuze voor *semi-hierarchy* en *equality*.

Hoeveelheid en mate van coördinatie en interactie (2.2)

Zowel formele coördinatie als interactie is wenselijk geacht, om de gezamenlijke doelen te kunnen realiseren, te controleren of de prestatie 'op koers ligt' en om niet te vervreemden van elkaar. Een minimum van tweemaal per jaar is genoemd tijdens het interview, maar geen maximum. Wel is af te leiden dat regelmatige afstemming gewenst is. Daarom de keuze voor *formal infrequent* en *formal frequent*.

Mate van organisatorische fusie (2.3)

Niet direct aan orde gekomen tijdens het interview. Af te leiden is dat volledige strikte scheiding tussen opdrachtnemer en –gever en gedeeltelijke scheiding (wel gezamenlijk resources inbrengen) wenselijk is.

Type arrangement (3.1)

"Er is altijd wel een vorm van een contract nodig" Niet alles hoeft tot in detail vast te liggen echter. Vandaar de keuze tussen *fully informal* en *fully formal*

Mate van formele 'resource' allocatie (3.2)

Moet formeel geregeld zijn aan het begin van de samenwerking.

Lengte van de overeenkomst (4.1)

Een lange overeenkomst heeft het nadeel dat de lange termijn ontwikkelingen (en benodigde aanpassingen aan het object) lastig te voorspellen zijn. Voorbeelden zijn klimaat en wensen van de omgeving. Toch is het aan te raden om langdurige contracten met een vaste looptijd (+/- 30 jaar) te gebruiken (een DBFM achtige constructie).

Eindresultaat en doel (4.2)

Het einddoel moet op hoofdlijnen vaststaan, maar met voldoende ruimte voor de aannemer om "aan de onderkant" zijn eigen pad te kiezen.

Scope van de beheeractiviteiten (4.3)

Zie eindresultaat en doel.

¹⁴⁴ Complete interview summaries are available on request by the author through sending an email.

Flexibiliteit van het arrangement (4.4)

Gezien het feit dat gekozen is voor een lange looptijd is een flexibel arrangement gewenst.

Opbrengsten verdeling (publiek – privaat) (5.1)

Geen specifieke voorkeur, maar wel gekoppeld aan prestatie.

Resource allocatie verdeling (publiek – privaat) (5.2)

Geen specifieke voorkeur, maar wel gekoppeld aan prestatie.

Besluitvormingsverdeling (5.3)

Niet direct ten sprake gekomen bij het interview, maar er is af te leiden dat de waarden dient te variëren tussen gelijkwaardig gecoördineerd (egalitarian, coordinated) enerzijds en hiërarchisch gecoördineerd (hierarchical, coordinated) anderzijds.

Een overzicht van het arrangement is weergegeven in figure A9.1

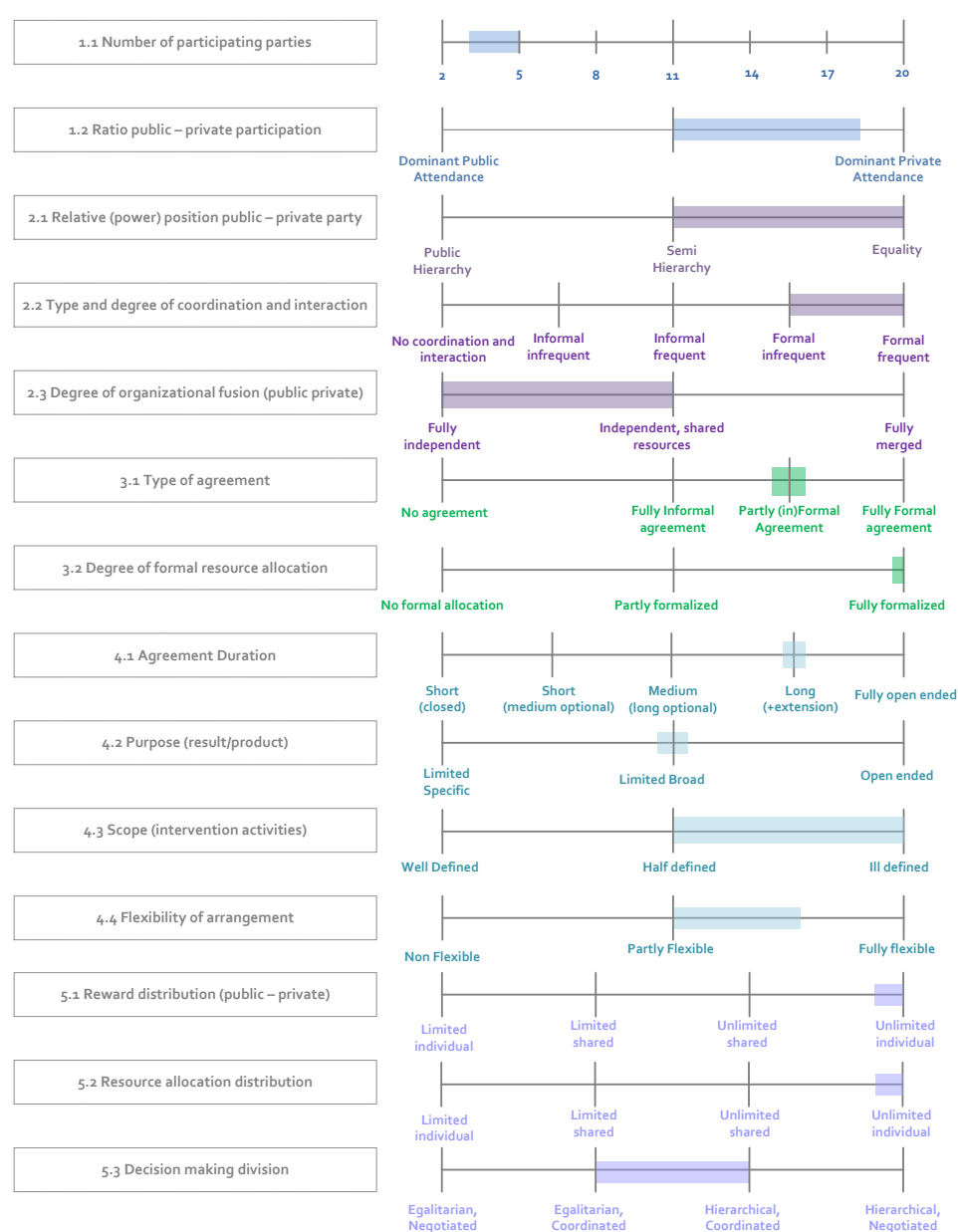


Figure A9.1 Preferred Arrangement Michon

Van Hengel

Aantal betrokken partijen (1.1)

Idealiter gezien zou het arrangement uit 6-7 partijen bestaan, waarvan één contractor. Die contractor zou dan eventueel wel meerdere subcontractors (onderaannemers) in dienst mogen nemen om de benodigde diversiteit aan specialismen in te schakelen en daarmee een hogere kwaliteit te leveren, maar hij blijft zelf aanspreekpunt en (eind)verantwoordelijke. Het aanstellen van één contractant voorkomt ook “welles-nietes spelletjes”. Om dit te voorkomen zou de overheid zich dan moeten bemoeien met de inhoud, hetgeen ten koste kan gaan van de kwaliteit. “De overheid moet alleen maar sturen op prestatiedoelen.” Je zegt als het ware tegen één partij: “jij bent verantwoordelijk voor het halen van de prestatiedoelen en hoe je dat doet zoek je maar uit.”

Numerieke Verhouding publiek – private deelname (1.2)

Dit is een afgeleide van het aantal betrokken partijen. Aangezien er maar één contractor uitmaakt van het arrangement is het vooral publiek dominant. Private stakeholders zouden eventueel voor meer private inbreng kunnen zorgen.

Relatieve machtspositie publieke – private partijen (2.1)

Om een goede samenwerking te stimuleren is volledige gelijkwaardigheid een vereiste. “Een goede samenwerking is noodzakelijk voor een goede kwaliteit.”

Hoeveelheid en mate van coördinatie en interactie (2.2)

Formeel, vaak. “Je kunt alleen maar samenwerking en vertrouwen opbouwen wanneer je elkaar vaak ziet”. “Als je iets gezamenlijk wil doen, dan moet je het ook echt gezamenlijk doen. Dat betekent dat je alle stappen gezamenlijk zet.”

Mate van organisatorische fusie (2.3)

De midden optie, het gezamenlijk inbrengen van resources, maar het gescheiden blijven als entiteit, krijgt de voorkeur. “Als je samenwerkt dan moet je ook bij elkaar zitten en dan moet je ook elkaar kunnen gebruiken.” Het is niet nodig om alle beschikbare resources ter beschikking te stellen voor Stuwten Maas, aangezien Stuwten Maas maar een onderdeel is van de totale activiteiten die Rijkswaterstaat uitvoert. Echter, er kleven ook gevaren aan het gezamenlijk inbrengen en beschikken over resources. Indien deze organisatorische vorm de vorm krijgt van een projectbureau of projectorganisatie die zich ‘afzondert’ van de oorspronkelijke organisatie loopt men het gevaar te vervreemden. De oorspronkelijk gestelde doelen kunnen verschuiven en daarmee kan de meerwaarde van de samenwerking geheel of gedeeltelijk verdwijnen. De afgeleide behoefte wordt dan belangrijker gevonden.

Type arrangement (3.1)

De voorkeur gaat uit naar een informele overeenkomst, waar niet alles tot in detail is geregeld, maar waar de hoofdlijnen wel vast liggen. “Je moet van tevoren wel praten over wat je belangrijk vindt: wat je wil bereiken en wat je doel is.” Daar moet je elkaar ook op aan (kunnen) spreken. Dat is ook het idee van samenwerken. De eerste scope dient in ieder geval vast te liggen, om een richting te schetsen waar de samenwerking heen moet.

Mate van formele ‘resource’ allocatie (3.2)

De allocatie van resources dient ook hoofdlijnen vastgelegd te zijn. Het is goed om aan het begin van de samenwerking elkaars verwachtingen te kennen. Het is niet aan te geven wat er precies op hoofdlijnen vastgelegd moet worden. Dat zal vooral duidelijk moeten worden uit de dialoog. Een intentieovereenkomst is aan te bevelen.

Looptijd van de overeenkomst (4.1)

Een lange looptijd (50 jaar) is gewenst, maar niet volledig vaststaand. De continuïteit van private partijen kan roet in het eten gooien. Als de omstandigheden het toelaten is het wenselijk om een zo lang mogelijke overeenkomst te hebben. Het is raadzaam om regelmatig de looptijd te evalueren.

Eindresultaat en doel (4.2)

Het eindresultaat, in de zin van prestatiedoelen die zouden in detail moeten worden vastgelegd.

Scope van de beheeractiviteiten (4.3)

De scope dient compleet open te zijn.

Flexibiliteit van het arrangement (4.4)

Gezien de lange looptijd is het raadzaam om niet alles vast te leggen. Daarbij zijn de resultaten voornamelijk van belang, aangezien die uiteindelijk leidinggevend zijn voor het handelen van de contractant. Een constructie waarbij de prestatiedoelen elke 10 jaar geëvalueerd en zo nodig bijgesteld worden is goed denkbaar.

Opbrengsten verdeling (publiek – privaat) (5.1)

Gelijkwaardige verdeling in de zin van overeenkomstig met het belang van de desbetreffende partij. Wel gekoppeld aan prestatie.

Resource allocatie verdeling (publiek – privaat) (5.2)

Idem

Besluitvormingsverdeling (5.3)

Gelijkwaardige beslissingsbevoegdheid, gecoördineerd om het maatschappelijke belang te behalen (en achterhalen)

Een overzicht van het arrangement is weergegeven in figuur A9.2

Waltje

Aantal betrokken partijen (1.1)

Een één-op-één relatie tussen opdrachtnemer en opdrachtgever is voor beide partijen wenselijk. Het is “vooral handig om de verantwoordelijkheden scherp te stellen.” Voor de opdrachtgever is het handig om één aanspreekpunt te hebben. Voor de opdrachtnemer is het prettig om zijn taken niet af te hoeven stellen met andere marktpartijen. Overigens gaat het hier om de eindverantwoordelijkheid. De verantwoordelijke marktpartij is vrij om andere marktpartijen in te schakelen om alle benodigde disciplines tot zijn beschikking te hebben. Het aantal betrokken partijen komt dus uit op 2.

Numerieke Verhouding publiek – private deelname (1.2)

Dit is een afgeleide van het aantal betrokken partijen. Aangezien er maar één contractor uitmaakt van het arrangement is de numerieke verhouding publiek – privaat gelijkwaardig.

Relatieve machtspositie publieke – private partijen (2.1)

De machtsverhouding moet “tegen het gelijkwaardige aan zijn, maar er kan er maar één de baas zijn.” “Dat is altijd het beste, anders krijg je veel te veel discussie.” Het is gezond dat de publieke opdrachtgever een doorslaggevende stem heeft: “de enige drijfveer van de publieke overheid zou moeten zijn het belang van het land, van de mensen die er wonen.” Voor een (private) opdrachtnemer hoeft dit niet altijd op te gaan.

Hoeveelheid en mate van coördinatie en interactie (2.2)

Coördinatie en interactie moeten sowieso formeel geregeld zijn. Daarbij is het niet per definitie nodig om dit frequent te doen, informele coördinatie en interactie is prima en zelfs ‘sneller’, zolang er maar “op gezette tijden toch even formeel een aantal zaken vastgesteld worden.” De zaken die de grootste risico’s dragen moeten formeel vastgelegd worden. Voorbeelden zijn het vervangingsmoment, de richtlijnen voor het ontwerp en de evaluatie van de contractant. De operationele beslissingen en activiteiten hoeven niet vast te liggen. Het is daar voldoende om de contractant op prestatie criteria af te rekenen.

Mate van organisatorische fusie (2.3)

“Hele aparte entiteiten zijn niet handig (..) maar een joint venture vind ik ook wel wat te ver gaan.” Een tussenversie is wenselijk, zodat de verantwoordelijkheden van opdrachtnemer en opdrachtgever scherp te houden, maar wel over voldoende middelen te beschikken om de verantwoordelijkheden vorm te geven.

Type arrangement (3.1)

“Ik vind dat er een volledig formele overeenkomst moet zijn, maar niet alles tot in detail geregeld moet worden.” “Er moeten hele harde, hele duidelijke, hele concrete afspraken gemaakt zijn over de te behalen prestatie, maar hoe die behaald worden dat is toch niet zo heel interessant.” De netwerkprestaties¹⁴⁵ zijn voldoende concreet.

Mate van formele ‘resource’ allocatie (3.2)

Voor dit element geldt hetzelfde als voor bovenstaande (3.1), namelijk dat het voldoende formeel vastgelegd moet worden zodat de netwerkprestaties gehaald kunnen worden.

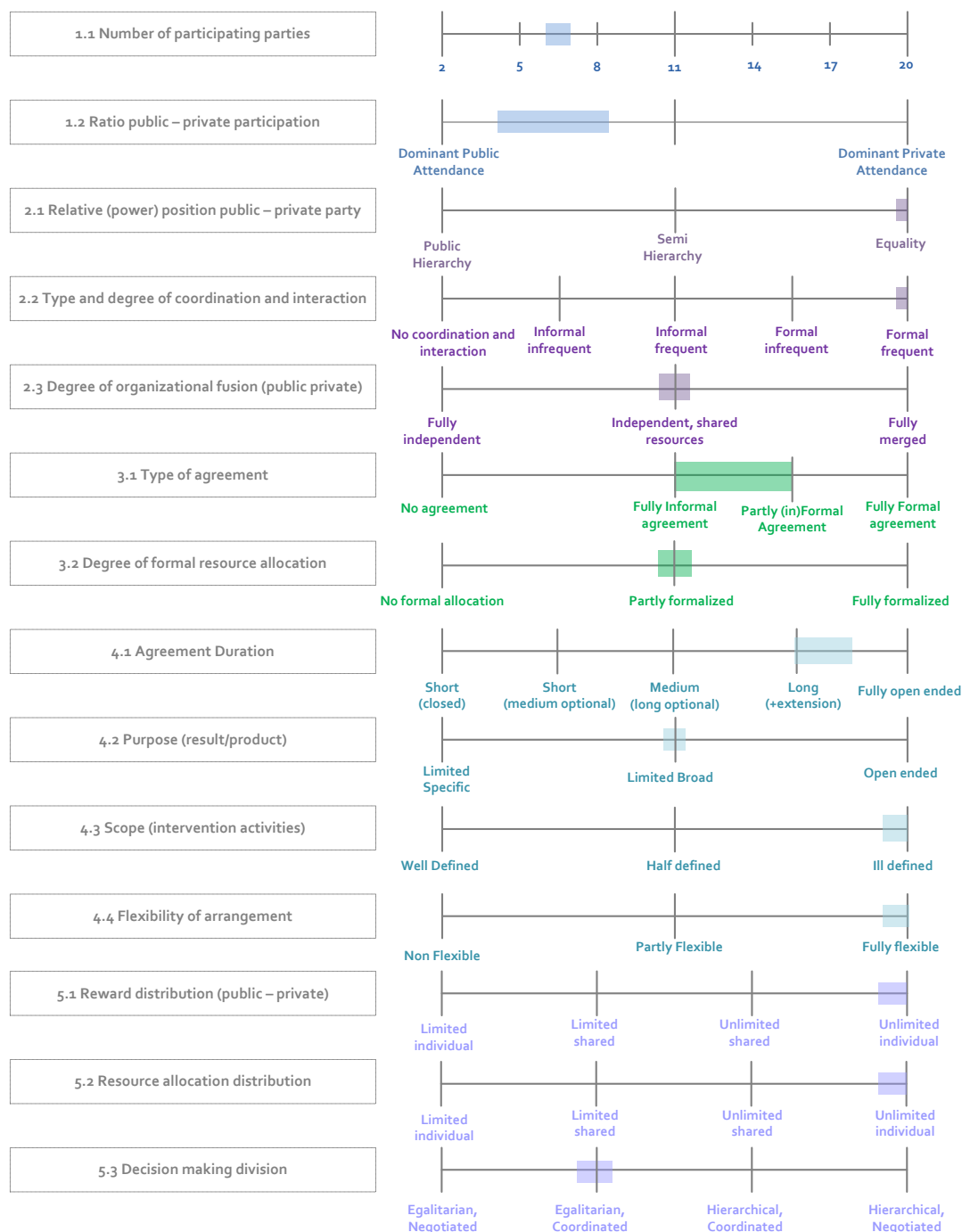


Figure A9.2 Preferred Arrangement van Hengel

¹⁴⁵ Voorbeelden: doorvaartijen voor scheepvaart, wachttijden bij sluizen, schuttijden van sluizen, waterhoogtes

Looptijd van de overeenkomst (4.1)

De voorkeur gaat uit naar een volledig open overeenkomst, voor onbepaalde tijd dus. Bij een vaste looptijd is er altijd het risico dat de overdracht moeizaam gaat: hoe is de kwaliteit van het object/de objecten, maar ook hoe moet het overgedragen worden aan een andere partij?

Eindresultaat en doel (4.2)

De resultaten moeten op hoofdlijnen vastgelegd worden. Dat betekent dat de gewenste netwerkprestaties vast moeten liggen.

Scope van de beheeractiviteiten (4.3)

“De scope moet altijd goed afgebakend zijn, anders verzand je in oeverloze discussies.”

Flexibiliteit van het arrangement (4.4)

Ik denk dat je ernaar moet streven om het volledig aanpasbaar te houden. Vooral als het voor onbepaalde tijd geldt of de langere termijn. “Je weet nu echt niet wat er over 10 jaar met je netwerk aan de hand is.” Vooral de ontwikkeling van de externe factoren zijn hierbij van belang. Door een acute externe oorzaak kunnen wijzigingen in het netwerk ook nodig zijn. Daarom dient er voldoende flexibiliteit ingebouwd te worden om de overeenkomst te wijzigen op elk moment dat nodig wordt geacht door alle partijen in de overeenkomst.

Opbrengsten verdeling (publiek – privaat) (5.1)

Opbrengsten verdeling op basis van prestatie is hier het meest geschikte invulling, met een gelijkwaardige verdeling.

Resource allocatie verdeling (publiek – privaat) (5.2)

De inbreng van financiële middelen zal ongelijkwaardig zijn. De overheid zal hoe dan ook het meeste geld in moeten brengen. Dat is nou eenmaal een eigenschap van infrastructuur. Eventuele meerkosten moeten gekoppeld worden aan prestatie.

Besluitvormingsverdeling (5.3)

Ongelijkwaardig, maar wel gecoördineerd. “Het is toch uiteindelijk een publiek belang dat ik vind (..) dat een marktpartij daar geen gelijkwaardigheid heeft ten opzichte van de overheid.”

De volgende pagina toont het arrangement zoals hierboven beschreven.

Een overzicht van het arrangement is weergegeven in figure A9.3

Albrecht

Aantal betrokken partijen (1.1)

Het is lastig om het aantal deelnemende marktpartijen aan te geven. Als je het contract in de markt zou zetten, zouden consortiums zich in kunnen schrijven. Bovendien, als je de overeenkomst aangaat met één partij dan kan die partij andere partijen inschakelen. Ook de verschillende fases (planning, uitvoering), maken het er niet makkelijk op. “Ik zou in ieder geval voor kiezen om aan de voorkant een aantal partijen te benaderen om met mij na te denken over goh hoe ik kan ik nou slim de vervangingsopgave in de Maas doen, de technische kant, en ook wat komt er dan achterweg aan belangenpartijen waar ik wat anders mee moet regelen. Volgens mij kan je dat op een open manier in de markt zetten dan kan je dat ook nog met meerdere partijen doen. Dat kan wel consequenties hebben voor in hoeverre die partijen in een volgende fase nog wel of niets iets kunnen als je besluit in deelopdrachten in de markt te zetten.” in de ideale wereld waar alles kan en mag begin ik aan het begin met het genereren en het verzamelen van ideeën en oplossingsrichtingen en daar kan ik voor kiezen van ik leg dat bij iemand die dat voor mij doet en die doet dat dan vervolgens met meerdere onderliggende partijen of ik doe dat zelf. En beide kunnen en dat is een afweging die je daarin moet maken van goh wat betekent dat voor het vervolg van het proces. Ik denk dat het hebben van een monopolie uiteindelijk innovatie niet ten goede komt. Bovendien, de vervangingswaarde van de Stuwten is groot, er is niet één partij die dat kan dragen. Het zou wel makkelijk zijn omdat je de prestatie maar met één partij hoeft af te

stemmen. De realiteitswaarde is echter beperkt. Vanuit dit oogpunt is gekozen om 2 – 5 marktpartijen deel te laten nemen aan het arrangement met een voorkeur voor 3 of meer partijen.

Numerieke Verhouding publiek – private deelname (1.2)

Dit is een afgeleide van het aantal betrokken partijen. Relatieve machtspositie publieke – private partijen (2.1)

“Ik zou kiezen voor een zo gelijkwaardig mogelijk arrangement” (..) “waar je nog op weg bent naar het samen uitvinden van wat het betekent dat je veel tijd steekt in overleg en afstemming, zowel over doelen als de wijze van doelbereiking uiteindelijk, zodat je samen over eens van h , dit zijn inderdaad de goede doelen en dit is ook het goede pad om daar te komen.” Juridisch gezien kan dit wel problemen opleveren.

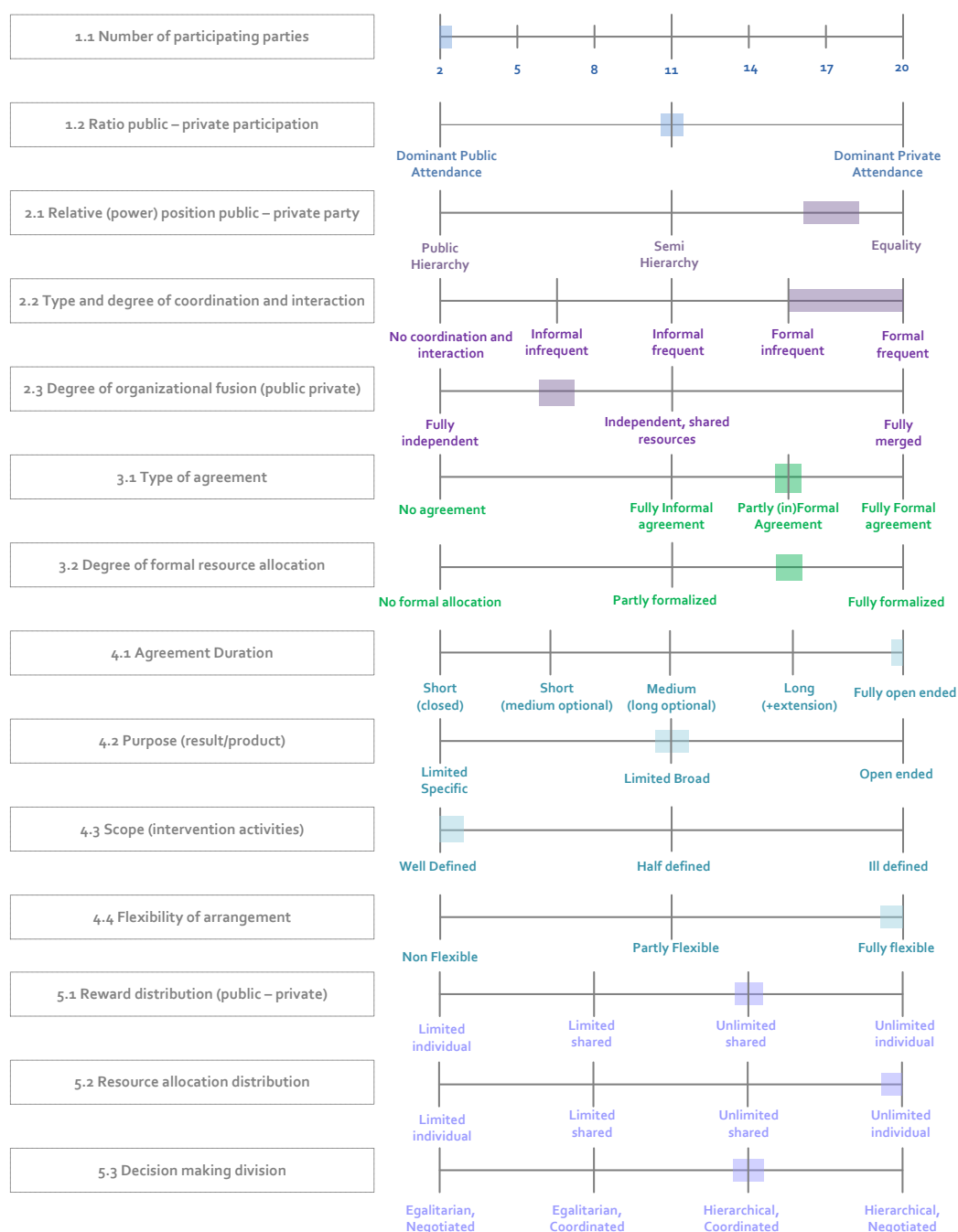


Figure A9.3 Preferred Arrangement Waltje

Hoeveelheid en mate van coördinatie en interactie (2.2)

“Als je een goede samenwerking hebt en je vaak overlegt hoeft je daarvoor niet veel formeel geregeld te hebben. Als het echter niet goed gaat dan moet je formeel wel het één en ander hebben vastgelegd.” Je ontkomt er niet aan om bepaalde zaken (financiën etc.) formeel vast te leggen, zodat je je als partijen achteraf altijd kan verantwoorden.

Mate van organisatorische fusie (2.3)

Volledige integratie is niet mogelijk. Publiek en privaat blijven aparte organisaties met andere doelstellingen. “Die kun je wel voor een groot deel synchroon laten lopen.” “Uiteindelijk wil een private entiteit toch graag winst maken voor zijn aandeelhouders en wil de overheid met name maximaal rendement op zijn investeringen. Daar kan je heel veel aan parallel laten lopen, maar volgens mij kun je dus je organisatie niet helemaal op elkaar integreren.” Idealiter gezien zou het goed zijn om naar een variant te werken met gezamenlijke inbreng en dus gezamenlijke beslissingen daarover. Dat kan goed zijn voor innovatie en kosten, maar verantwoordingstechnisch is dit lastig.

Type arrangement (3.1)

Een contractueel vastgelegd overeenkomst op hoofdlijnen is het meest ideaal, “maar dat veronderstelt wel dat je over die hoofdlijnen en de wijze waarop je daar uiteindelijk invulling aan geeft, frequent overlegt” en de onduidelijkheden verder invult. “Je ontkomt er niet aan om gewoon contractueel afspraken te maken al is het maar omdat ik anders geen geld voor betaling heb.” Wat vooral vast moet liggen is de geografische scope, de prestatie doelen (eindresultaat) en een mechanisme om de ‘onduidelijkheden’ en opengelaten zaken verder in te vullen. “Een tussentijdse detaillering van eerdere afspraken” “Naar verloop van tijd vul je dingen verder in.”

Mate van formele ‘resource’ allocatie (3.2)

“Bij geld ontkom je er niet aan om dat redelijk volledig af te spreken.” In dat geval is het nog steeds mogelijk om ‘op hoofdlijnen te beginnen’, mits dit vanaf het begin ook naar de achterban (Tweede Kamer) zo gecommuniceerd wordt. Dus heel duidelijk het onderscheid maken tussen vaststaande budgetten en variabele budgetten die gaandeweg specifieker worden. Voor het delen en inbrengen van kennis is het voldoende om te vermelden dat dit gedeeld wordt, heel globaal vast te leggen.

Looptijd van de overeenkomst (4.1)

“Als jij een opdrachtnemer wat de ruimte wil geven om intelligent met zijn prestaties om te gaan en daar wat van te leren om het beter te doen, kom je al gauw boven de 10 jaar uit.” “Een opdrachtnemer moet ook de mogelijkheid hebben om daadwerkelijk wat aan die prestaties te doen.” Er dient wel een vast eind moment te zijn, met een optie tot verlenging. Tussendoor moeten de prestaties geëvalueerd te worden om te bepalen de overeenkomst al dan niet voort te zetten.

Eindresultaat en doel (4.2)

Het eindresultaat moet zoveel mogelijk op hoofdlijnen vastliggen, maar er zijn een aantal zaken die gedetailleerd moeten, zoals bijvoorbeeld ‘bedienprocedures’ van Stuwten.

Scope van de beheeractiviteiten (4.3)

De scope dient op hoofdlijnen vast te staan, dat is verdeling van taken op grond van de prestatiedoelen.

Flexibiliteit van het arrangement (4.4)

Op gezette tijden dient de voortgang onderling te bespreken, maar vooral om de ‘hoofdlijnen specifiek te maken’ en eventueel wijzigingen aan te brengen. Bijvoorbeeld: elke vier jaar kijken of er reden is tot bijstellen.

Opbrengsten verdeling (publiek – privaat) (5.1)

De opdrachtnemer dient in ieder geval de prikkel te hebben om slimme (kostenbesparende) oplossingen toe te passen. Een gedeelte verdeling van de opbrengsten is daarom aan te raden. Het vraagt ook om een bereid van de opdrachtgever te investeren, maar wel met een vaste terugverdien tijd. Ook de opdrachtgever moet delen in de extra opbrengsten.

Resource allocatie verdeling (publiek – privaat) (5.2)

Zelfde principe als in 5.1

Besluitvormingsverdeling (5.3)

“Uiteindelijk is de opdrachtgever degene die aan het end de verantwoording in de kamer moet afleggen dus die zal uiteindelijk degene zijn die het definitieve besluit moet nemen, maar het definitieve besluit kun je nooit nemen zonder dat je daar ook met een opdrachtnemer over hebt gehad. En dat hij ook weet wat dat voor hem zal betekenen. En je kunt heel veel aan de voorbereiding van het besluit gemeenschappelijk doen ervanuit gaande dat je samenwerkt.”

Een overzicht van het arrangement is weergegeven in figure A9.4

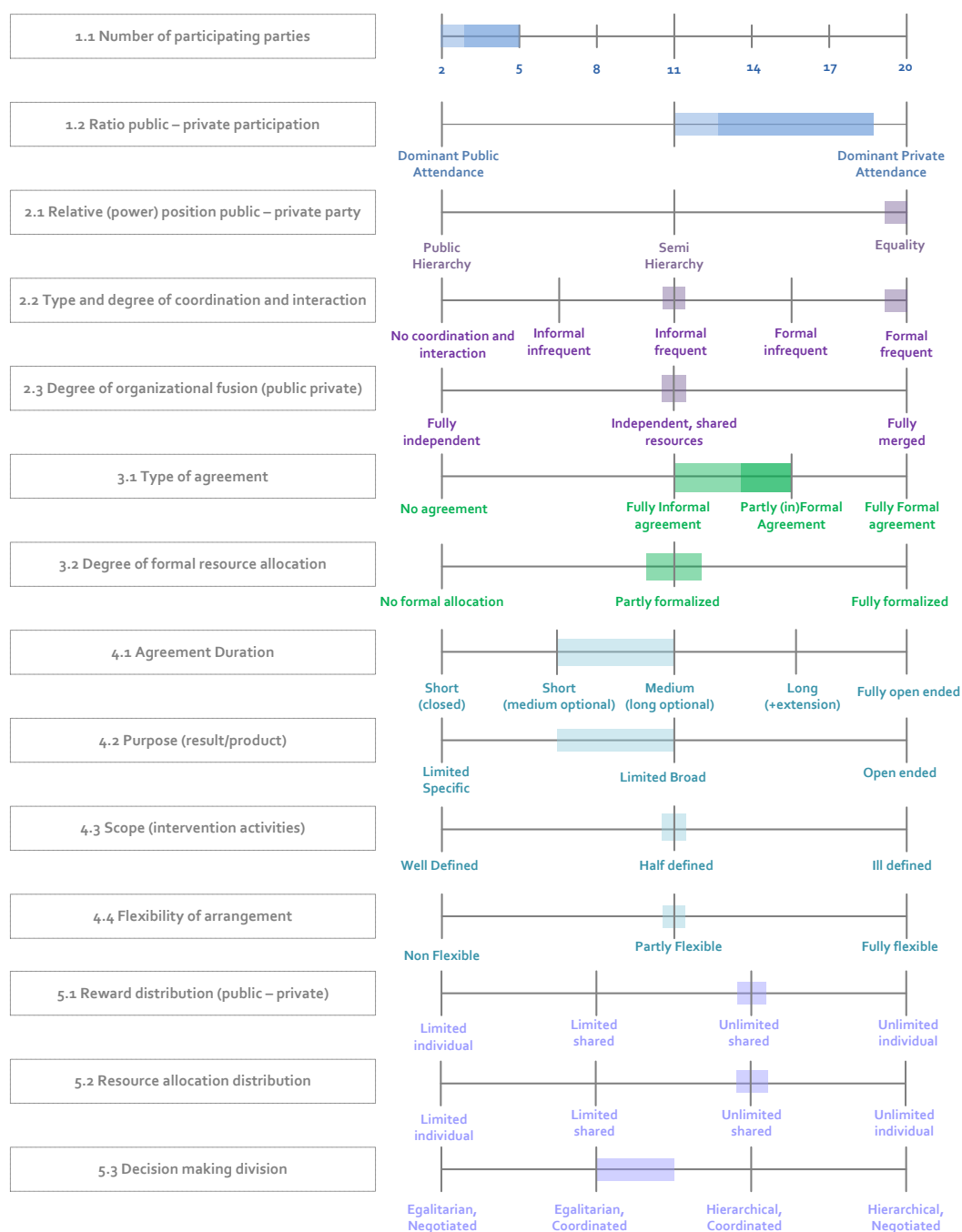


Figure A9.4 Preferred Arrangement Albrecht

Relatieve machtspositie publieke – private partijen (2.1)

“Ik zou kiezen voor een zo gelijkwaardig mogelijk arrangement” (..) “waar je nog op weg bent naar het samen uitvinden van wat het betekent dat je veel tijd steekt in overleg en afstemming, zowel over doelen als de wijze van doelbereiking uiteindelijk, zodat je samen over eens van h , dit zijn inderdaad de goede doelen en dit is ook het goede pad om daar te komen.” Juridisch gezien kan dit wel problemen opleveren.

De Jong

Aantal betrokken partijen (1.1)

Meerdere marktpartijen zullen betrokken moeten worden, omdat de vervangingsopgave Stuw  Maas simpelweg niet beheersbaar is voor      marktpartij. “We denken dat we grotere projecten wel aankunnen, maar dat is niet zo. Dan loop je gewoon onacceptabele risico’s. Dat moet je ook niet willen als marktpartijen, maar ook niet als opdrachtgever.” Je moet dus meerdere partijen hebben. Marktpartijen kunnen ongeveer 100-200 miljoen zelf dragen¹⁴⁶. Het areaal kan in meerdere werkpakketten ingedeeld worden. Aanbesteden op object basis is niet handig, omdat het aantal objecten (stuwen) nog niet vast ligt. Eventueel is het mogelijk om      marktpartij verantwoordelijk te houden die de samenwerking opzoekt met meerdere marktpartijen.

Numerieke Verhouding publiek – private deelname (1.2)

Dit is een afgeleide van het aantal betrokken partijen. Afhankelijk van het aantal marktpartijen zal het gelijkwaardig zijn of privaat dominant.

Relatieve machtspositie publieke – private partijen (2.1)

Uiteindelijk zal het zijn wie betaalt bepaald. Aangezien de publieke partij altijd (grotendeels) betaald, zal die wat meer dominant zijn. Per contractvorm kan het verschillen hoe het daadwerkelijk uitpakt.

Hoeveelheid en mate van co rdinatie en interactie (2.2)

Dit moet zo informeel mogelijk blijven. “Het wijst zichzelf toch wel uit.” Er zal zowel horizontaal als verticaal overleg nodig zijn. “Dat moet je gewoon gezamenlijk bepalen. Ik vind niet dat je dat in een contract moet vastleggen.” “Hoe transparanter contracten worden, hoe vaker je daarover overleg nodig hebt.” Informele interactie is over het algemeen ook frequenter.

Mate van organisatorische fusie (2.3)

Een fusie is niet re el. De partijen dienen tot aan het detailontwerp¹⁴⁷ gezamenlijk op te trekken en verantwoordelijkheid te dragen. Daarna kan de marktpartij het prima zelf af. “Als je kiest voor een alliantiemodel, dan kies je eigenlijk voor een alliantie tot en met ontwerp en daarna zijn het gewoon uitvoeringspakketten met een eigen verantwoordelijkheid. Dat zijn private verantwoordelijkheden.” Daarvoor worden verantwoordelijkheden gedeeld.

Type arrangement (3.1)

Een overeenkomst op hoofdlijnen is het meest geschikt. Op hoofdlijnen betreft zowel ‘op functioneel niveau’, als de basisareaalgegevens (dominante informatie) die beschikbaar moeten zijn.

Mate van formele ‘resource’ allocatie (3.2)

De inleg van financi  en kennis dient sowieso op hoofdlijnen te worden vastgelegd. Verder ook de afstemming met de partijen buiten het arrangement en het betrekken daarvan. Bijvoorbeeld het inbrengen van de kennis van kennisinstellingen die betrokken zijn bij normeringen vanaf het begin is daar een voorbeeld van. Ook financiers dienen vanaf het begin betrokken te zijn als partner, zodat ze vanaf het begin ook eventueel bij kunnen sturen.

¹⁴⁶ Voor Stuw  Maas zal dit puur op vervangingswaarde neerkomen op 2   3 marktpartijen. Een nieuwe indeling van de Maas zal om een grotere omvang vragen, dus meerdere marktpartijen. Daarom is gekozen voor 2 – 5 marktpartijen.

¹⁴⁷ De ‘ontwerpvolgorde’ is definitiefontwerp, detailontwerp, uitvoeringsontwerp.

Looptijd van de overeenkomst (4.1)

De looptijd zal afhangen van de inbreng van kapitaal (publiek of privaat). Dit kan 10 jaar zijn in geval van publiek, maximaal 30 jaar in geval van private financiering.

Eindresultaat en doel (4.2)

“Ik ben er voor om het eindresultaat zoveel mogelijk open te houden.” Je kunt iets omschrijven als je echt niet anders wil.” Voor Stuwen Maas is het goed om een systeemgerichte benadering te kiezen, waarbij je veel openlaat en eigenlijk alleen de afstemming met andere netwerken vastzet. Systeemgericht wil zeggen dat de oplossing voor het systeem (netwerk) gezamenlijk geoptimaliseerd dient te worden.

Scope van de beheeractiviteiten (4.3)

Het is goed om dit flexibel te houden, “omdat de huidige partijen er misschien nog niet helemaal aan toe zijn.”, Je kunt het helemaal privaat uitbesteden, maar de vraag is of de Maas daar al, of dit project daarvoor al geschikt is.

Flexibiliteit van het arrangement (4.4)

Het is niet goed om het volledig vrij te maken, maar wel gedeeltelijk op gezette momenten.

Opbrengsten verdeling (publiek – privaat) (5.1)

Er dient in ieder geval een gelijkwaardige verdeling te zijn, zodat zowel opdrachtnemer als opdrachtgever kunnen profiteren van eventuele meevallers. Innovatie dient gestimuleerd te worden, wat betekent dat partijen vanaf het begin af aan gezamenlijke verantwoordelijkheid dragen. Koppeling aan prestatie is in deze zin dus wenselijk.

Resource allocatie verdeling (publiek – privaat) (5.2)

Als het budget overschreden wordt kan het niet zo zijn dat er één partij nog aan het verdienen is. Ook hier geldt dus een gelijkwaardige verdeling.

Besluitvormingsverdeling (5.3)

De besluitvorming hangt samen met de afgesproken risicoverdeling en inbreng. “Bij een hogere alliantie hoort gelijkwaardiger stemrecht.”

Een overzicht van het arrangement is weergegeven in figure A9.5

Van Vuren

Aantal betrokken partijen (1.1)

Maximaal twee marktpartijen dienen betrokken te worden in het arrangement, vanuit de gedachte om de samenwerking overzichtelijk te houden: “als zo’n samenwerking te complex is en het wordt hem niet, dan is het wel prettig om te kunnen wijzen.” Het maximale aantal van marktpartijen betreft de partijen die de eindverantwoordelijkheid dragen. Ze zijn vrij om andere partijen te betrekken.

Numerieke Verhouding publiek – private deelname (1.2)

Deze element waarde is een afgeleide van bovenstaand element.

Relatieve machtspositie publieke – private partijen (2.1)

De verhouding publiek privaat dient ongeveer 60 – 40 te zijn.

Hoeveelheid en mate van coördinatie en interactie (2.2)

Het is verstandig om de mate coördinatie en interactie formeel vast te leggen. Er moeten frequente afstem- en evaluatiemomenten zijn. Dat hoeft niet elke maand te gebeuren, maar wel regelmatig.

Type arrangement (3.1)

De verdeling van verantwoordelijkheden (‘wie is waarop aanspreekbaar’) dient formeel te worden vastgelegd.

Mate van formele 'resource' allocatie (3.2)

"Je moet wel wat vastleggen, maar het mag niet vrijblijvend zijn." De vrijheid moet voldoende zijn zodat elke partij zijn eigen (bedrijfs)processen efficiënt in kan richten. Daarom is gekozen voor *partly formalized*.

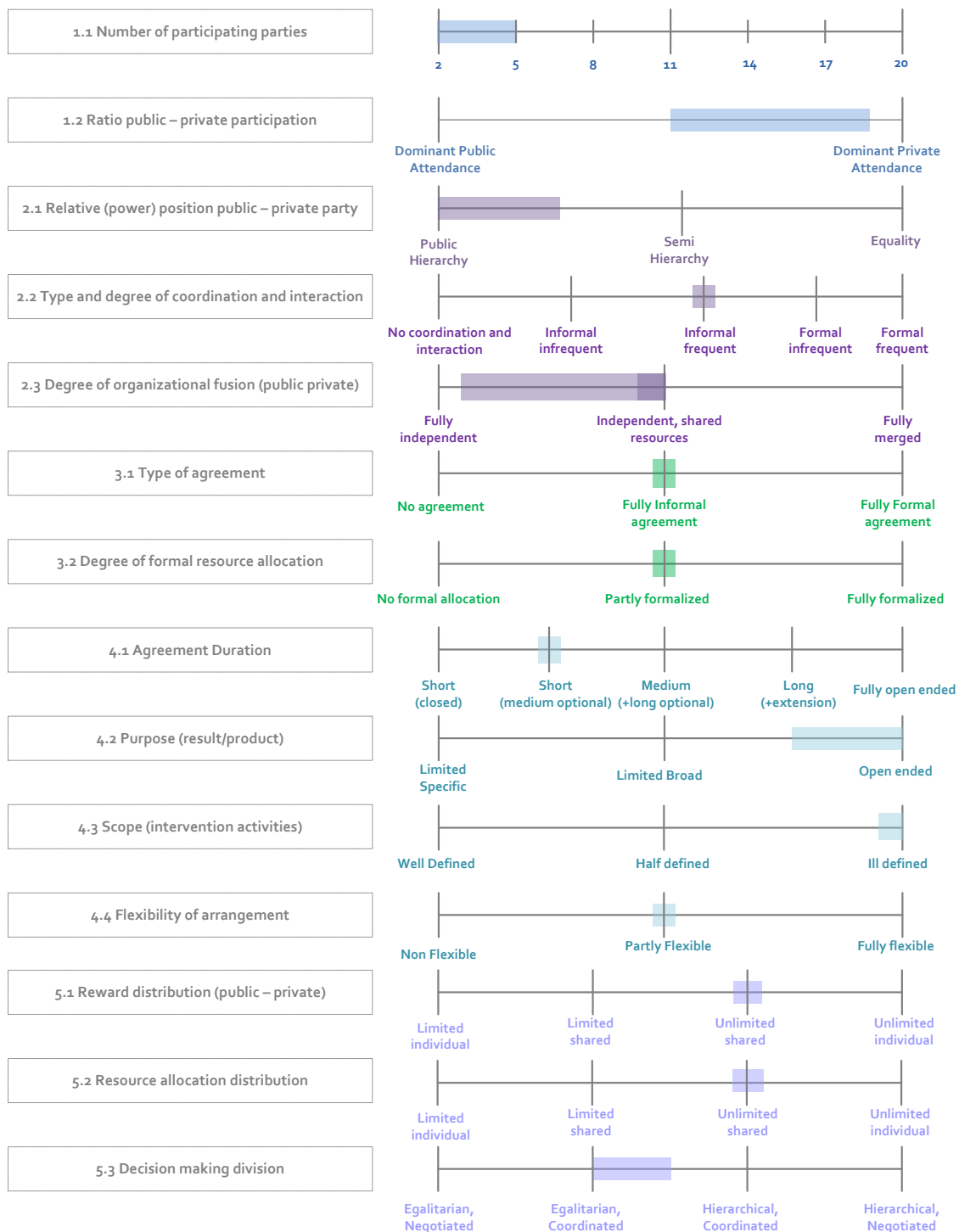


Figure A9.5 Preferred Arrangement de Jong

Looptijd van de overeenkomst (4.1)

Her is verstandig om de overeenkomst voor minimaal 50 jaar vast te leggen. De exacte looptijd ligt dus open.

Eindresultaat en doel (4.2)

De voorkeur gaat uit om het eindresultaat op hoofdlijnen vast te leggen. Dat betekent dat het eind resultaat in prestatiedoelen geformuleerd wordt. Specifieke invulling zal naar verloop van de overeenkomst verder ingevuld worden.

Scope van de beheeractiviteiten (4.3)

De scope hoeft aan het begin van de overeenkomst niet helemaal vast te staan, maar wel weer op hoofdlijnen. Het is niet nodig om alle taken en taakverantwoordelijkheden tot in detail vast te leggen.

Flexibiliteit van het arrangement (4.4)

Het is goed om de scope, het eindresultaat en de looptijd tussentijds aan te passen, maar dat zal nooit eenzijdig moeten gebeuren. Je maakt wel afspraken met elkaar voor de periode van 50 jaar. Gaandeweg kan het blijken dat de samenwerking minder goed loopt dan aanvankelijk gedacht. Stuwten Maas is van groot belang voor de Nederlandse economie, dus als overheid moet je de mogelijkheid hebben om tussentijds bij te sturen indien nodig. Gedeeltelijk flexibel is de beste keuze, waarbij op gezette tijden aanpassingen doorgevoerd worden indien nodig.

Opbrengsten verdeling (publiek – privaat) (5.1)

“Ik zou zeggen koppelen aan afspraken en verantwoordelijkheden.” Als de private partij een voordeel haalt, dan is het logisch dat hij daar de vruchten van plukt. Dit valt dus onder ‘unlimited individual’.

Resource allocatie verdeling (publiek – privaat) (5.2)

Zie element 5.1. “Als overheid wil je niet voor de knulligheden van een aannemer opdragen.”

Besluitvormingsverdeling (5.3)

Besluitvorming moet gecoördineerd worden. Afhankelijk van welk taakalternatief model je kiest zal het in het gemeenschappelijk belang of in het eigen belang beslist worden.

Een overzicht van het arrangement is te vinden in figure A9.6

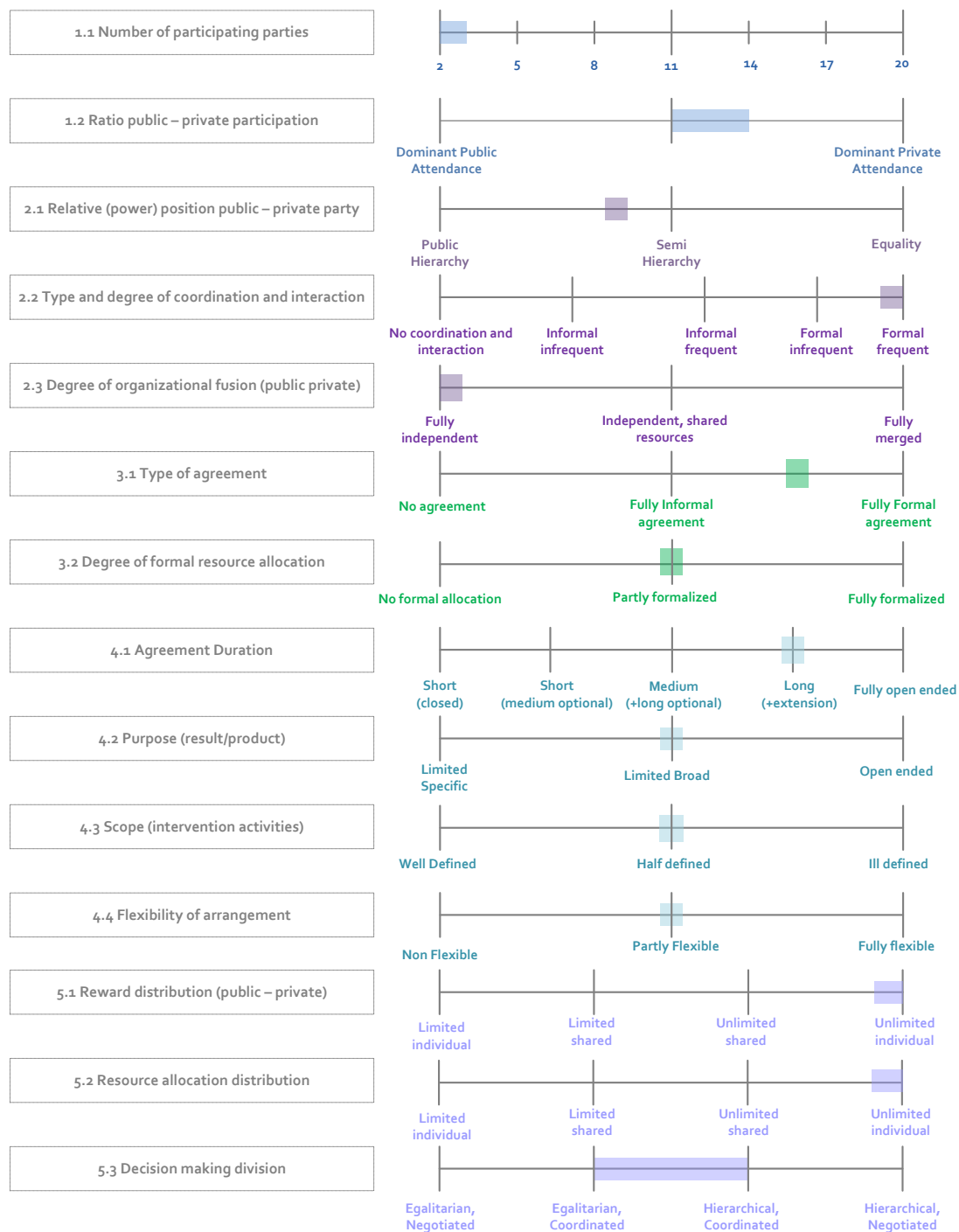


Figure A9.6 Preferred Arrangement de Jong

Appendix 10 Score Table Public – Private Task Allocation

This appendix provides an overview of the task allocation preferences as indicated during the case study interviews (see Table A.10.1).

Table A.10.1 Overview of public-private task allocation as a result from Case Study Interviews

Task	ID	Public	Private	Private (Public)	Public (Private)	Public / Private	Public & Private	% private invlvmnt ¹	% private Respon. ²	% public Resp. ³
Formulation of performance goals and targets	IC1	1,3			2,4,5,6			66,7	0	83,3
Measuring network and object performance	IC2		1,2,3,4,5,6					100	100	0
Determining and deciding on investment budget	IC3		2		3,4		5,6	80	60	80
Identification, planning and evaluation of maintenance	IC4		2,3,4,6	1			5	100	83,3	33,3
Determining replacement moment and replacement strategy including design	IC5		2	1	3,4		6	100	60	80
Identification of external factors and impact assessment	IC6	3	2,4		6		5	80	60	60
Formulation of acceptable risk levels including the integration with decision making	IC7	2,3			4,6		5	60	20	100
Design of data collection process	IC8		2,3,4		6	5		100	80	40
								85,8	60	59,6
Formulation of long-term inter network performance targets	EC1	3,5			4,6			50	0	100
Formulation of long-term inter network investment needs	EC2				3,4		5,6	100	50	100
Identification of inter network external factors and impact assessment	EC3	3			4,6		5	75	25	100
Translation of long-term inter-network performance goals to network specific goals	EC4	5	3,4,6					75	75	25
Formulation of inter network data collection strategy	EC5		3,4,5		6			100	75	25
Long-term inter-network capacity planning	EC6	3	5		4		6	75	50	75
Integration of asset data to inter network level	EC7	3	4,5		6			75	50	50
								75	46,4	67,9
Identifying stakeholder requirements including prioritization	SI1				2,3,4,5	6		100	25	100
Identifying local infrastructure manager requirements	S1	4	2,3		5		6	80	60	60
Coordination of management activities with local infrastructure manager	S2	4	2,3		5		6	80	60	60
								80	60	60

Note. 1 = Michon; 2 = van Hengel; 3= Waltje; 4 = Albrecht; 5= de Jong; 6= van Vuren

1: % private invlvmnt = $(\sum \text{Private} + \text{Private (Public)} + \text{public Privat} + \text{Public \& Private} / \sum \text{Public} + \text{Private} + \text{Private (Public)} + \text{Public (Private)} + \text{Public Private} + \text{Public \& Private}) * 100\%$

2: % private Respon. = $\sum \text{Private} + \text{Private (Public)} + \text{Public Private} + \text{Public \& Private} / \sum \text{Public} + \text{Private} + \text{Private (Public)} + \text{Public (Private)} + \text{Public Private} + \text{Public \& Private}) * 100\%$

3: % public Resp. = $\sum \text{Public} + \text{Public (Private)} + \text{Public Private} + \text{Public \& Private} / \sum \text{Public} + \text{Private} + \text{Private (Public)} + \text{Public (Private)} + \text{Public Private} + \text{Public \& Private}) * 10$

Appendix 11 Results of Evaluation Session

Scores Alternatief 1

Costs		
Respondent	Score	Explanation
Roovers	-/+	Risico dat ze teveel...
Peeters	+/- / +	Verwacht uitmiddeling kosten. Wellicht hele lichte verbetering
Keizer	-	OG in regie --> organisatie (-); prikkels efficiënt te werken (+); winst ON voor niet uitvoeren van activiteiten (-)
Berk	-	-
Vergouwen*	+	Potentie is groot, alles in 1 hand, zou veel inefficiëntie uit kunnen (+); Maar achter hoofdaannemer gaat wel wereld aan leveranciers en subaannemers schuil; Geen concurrentiedruk (-)
Hof*	+/-	Redelijk traditionele hiërarchische verhouding van aansturing.

Innovation		
Respondent	Score	Explanation
Roovers	+	-
Peeters	+	Arrangement biedt ruimte voor innovatie door mogelijkheden looptijd contract te bepalen
Keizer	++	Prestatiedoelen,... (+); ON vrij in wensen stakeholders (++)
Berk		
Vergouwen*	++	Daar waar geld verdient kan worden, zullen private partijen innoveren
Hof*	+/-	Innovatie zal moeten komen uit redelijk gebruikelijke verhouding opdrachtgever en uitvoerend contractant. Verandering zie ik dan ook niet.

Quality		
Respondent	Score	Explanation
Roovers	+/-	Potentiële conflicten? Wensen die je niet meenement als bouwer politieke roering geven. Wel goede checks & balances
Peeters	-	Door mogelijkheden van ontstaat conflict verwacht ik verslechtering van kwaliteit
Keizer	+/- / -	Risico snel lat te hoog -> onnodige kwaliteit (-); wensen van ON conflicterende doelen OG (+/-)
Berk		
Vergouwen*	+	Moeilijk te voorspellen, is uiteindelijk voor groot deel van externe factoren afhankelijk
Hof*	+/-	Kwaliteitsverbetering zal moeten komen uit redelijk gebruikelijke verhouding opdrachtgever en uitvoerend contractant. Verandering zie ik dan ook niet.

Scores Alternatief 2

Costs		
Respondent	Score	Explanation
Roovers	+/-	-
Peeters	+/-	Afhankelijk van: polderen; snelle beslissingen
Keizer	+/-	Samenwerking efficiëntie (+); banken gaan een rol spelen (-)
Berk	+	Doorlooptijd 50 jaar. Je kunt niet eenzijdig van het contract af, dus verplicht optimaliseren
Vergouwen*	+/-	Voor het netwerk van RWS verwacht ik geen verbetering door de relatief grote inbreng van omgeving en dus andere belangen die deels tegenstrijdig zullen zijn aan het zo efficiënt mogelijk onderhouden van het RWS netwerk
Hof*	+	Gezien de hogere mate van betrokkenheid en invloed van de stakeholders op basis van gelijkwaardigheid zal er veel sneller en in hogere mate resultaat behaald worden op de gestelde doelen.

Innovation		
Respondent	Score	Explanation
Roovers	+/-	Doorlooptijd en samenwerking (+); zijn er voldoende prikkels? Veel samenwerking dus minder innovatie (-)
Peeters	+/-	Status quo denk ik; of process innovatie
Keizer	+	Vertrouwen 50 jaar (++); prikkel nodig om er niet uit te stappen (-)
Berk	++	Verplicht na blijven denken
Vergouwen*	+	Door prestatiedoelen wel prikkel, maar afgezwakt door stakeholderbelangen, zal veel gericht zijn op consensus besluiten minder op innovatie
Hof*	+	Je kan je voorstellen dat door de hogere mate van betrokkenheid en hogere frequentie van overleg (meer interactie), van de stakeholders met de opdrachtgever en de contractant, kan leiden tot een grotere mate van oplossingsgerichtheid en innovatie.

Quality		
Respondent	Score	Explanation
Roovers	+	Politiek zit in je proces; bij voldoende samenwerking + vertrouwen kan er hoge kwaliteit ontstaan; minder juridisch dan alternatief 1
Peeters	+	Denk een verbetering kwaliteit. Ook doelen die door alle partijen ondersteund worden
Keizer	++	Op basis van doelen (+); Elkaar versterken + vertrouwen opbouwen (+)
Berk	+	-
Vergouwen*	-/+	Wederom moeilijk te voorspellen, maar ik denk minder dan bij alternatief 1, omdat de focus daar minder op is
Hof	++	De hogere mate van betrokkenheid en invloed op de netwerkprestaties door de stakeholders, zal bij diezelfde stakeholders er toe leiden dat er meer draagvlak en commitment is op de gestelde netwerkdoelen en de behaalde resultaten hierop.

Scores Alternatief 3

Costs		
Respondent	Score	Explanation
Roovers	+/-	Elkaar scherp houden(+) / risico's politiek spel erbuiten (-)
Peeters	+	Efficiency: drie / vier partijen
Keizer	+	Integrale oplossingen, meerjarig dus investeren
Berk	+/-	Verdeling tussen contract lastig gedurende looptijd
Vergouwen*	+	Opdelen onder meerdere contractanten levert inefficiencies op tov alternatief 1, maar wel meer concurrentiedruk
Hof*	+/-	Redelijk traditionele hiërarchische verhouding van aansturing.

Innovation		
Respondent	Score	Explanation
Roovers	+	Door kruisbestuiving
Peeters	+/-	Innovatie - -> wijzen naar elkaar
Keizer	+/-	Stakeholders (-) / verbetering door samenwerking (+)
Berk	+	-
Vergouwen*	+	Prestatiedoelen prikkelen maar concurrentie en beperktere contractsduur zwakken dit wat af
Hof*	+/-	Innovatie zal moeten komen uit redelijk gebruikelijke verhouding opdrachtgever en uitvoerend contractant. Verandering zie ik dan ook niet.

Quality		
Respondent	Score	Explanation
Roovers	+	Minder samenwerking
Peeters	+	?....
Keizer	++	Vrijheid
Berk	+	-
Vergouwen*	+/-	Moeilijk te voorspellen, maar leidt vermoedelijk tot suboptimalisaties door verschillende contractanten met eigen netwerkdeeltje
Hof	+/-	Kwaliteitsverbetering zal moeten komen uit redelijk gebruikelijke verhouding opdrachtgever en uitvoerend contractant. Verandering zie ik dan ook niet.

Results voting billes

Respondent	Preferred Alternative	Score			Explanation
		C	I	Q	
Roovers	Alternative 3	+	+	+	3 lijkt betere beheersing & allocaties van risico's mogelijk te maken en stimuleert innovatie; 2 lijkt 'polderen +' en zal tot meer kwaliteit leveren
Peeters	Alternative 3	+	+/-	+	Alternatief 3 = beste van 2 werelden denk ik. Al zou door cultuurverandering 1 ook een mooie kans ligt
Keizer	Alternative 3	+	+	++	Risico's beheerst. Op basis van samenwerking (o.b.v. Tender consortium); Doel gericht
Berk	Alternative 2	+	+	+	Lange doorlooptijd is gunstig voor innovatie. Risico's in samenwerking. Eis is transparanten vertrouwen
Vergouwen*	Alternative 1	+	++	+	Ik zit zelf altijd met aanbestedingsregels in mijn hoofd en dan denk ik dit is nooit mogelijk. Maar vanuit theoretisch perspectief absoluut een interessant vergezicht. In feite is dit het uitbesteden/privatiseren van Rijkswaterstaat of wel het uitvoeren van het totale takenpakket van RWS door een private partij.
Hof*	Alternative 2	+	+	++	Belangrijkste verschil met 1 en 3 is hoge mate van betrokkenheid stakeholders. Wat mij betreft de sleutel tot een betere kwaliteit en meer innovatie. Daardoor een positief effect op de kosten.

Respondent	Costs	Innovation	Quality
Roovers	Alternative 3	Alternative 3	Alternative 2
Peeters	Alternative 3	Alternative 1	Alternative 3
Keizer	Alternative 3	Alternative 2/3	Alternative 3
Berk	-	-	-
Vergouwen	-	-	-
Hof	-	-	-

