De vervangingsopgave in de Nederlandse vaarwegen: volstaat een *smart* aanpak?

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Bijdrage aan het Colloquium Vervoersplanologisch Speurwerk
24 en 25 november 2016, Zwolle

Samenvatting

Een van de oudste Nederlandse transportnetwerken staat voor een grote opgave: hoe de grootschalige veroudering in het nationale vaarwegennet aan te pakken? Het vervangen en renoveren van bestaande infrastructuur lijkt wezenlijk anders dan het aanleggen van nieuwe infrastructuur. De vraag is echter in hoeverre institutionele structuren zijn toegesneden op deze nieuwe uitdaging. Dit artikel brengt in kaart hoe bestaande structuren worden aangepast en welke nieuwe structuren verkend worden in de praktijk. We concentreren ons daarbij op het agentschap Rijkswaterstaat, dat een centrale rol speelt in de ontwikkeling en beheer van vaarwegen.

Door middel van een transactiekostenperspectief proberen we de afweging tussen bestaande en nieuwe institutionele structuren inzichtelijk te maken. Een transactie-kostenperspectief gaat uit van verschillende partijen die vrijwillig samenwerken om gezamenlijk hun doelen te realiseren. Institutionele arrangementen structureren deze samenwerking, hetgeen transactiekosten met zich mee brengt. De centrale aanname van een transactiekostenperspectief is dat partijen zullen proberen deze transactiekosten te verlagen: institutionele structuren zullen naar verwachting daarom steeds efficiënter worden ingericht. Dit kan door ofwel bestaande structuren te optimaliseren, of door fundamenteler het bestaan van deze structuren tegen het licht te houden.

Uit onze empirische analyse blijkt dat Rijkswaterstaat hinkt op twee gedachten. Enerzijds zet ze sterk in op het optimaliseren van bestaande structuren. Het Sluizenprogramma is hier een goed voorbeeld van: een aantal vervangingsprojecten zijn geclusterd om ‘smart’ te opereren. Interne transacties worden verlaagd door middel van voorspelbaarheid en uniformiteit. Anderzijds is Rijkswaterstaat zich ook strategisch aan het herbezinnen. In de recentelijk aangepaste *Strategische Visie Vervanging en Renovatie* wordt bijvoorbeeld nadrukkelijker de relatie met de regio gelegd. Verwacht wordt dat het aangaan van samenwerking met regionale partijen – externe transacties – leidt tot meer maat-schappelijke meerwaarde, maar het ook meer kosten en risico’s met zich meebrengt.

De vervangingsopgave wordt zo nadrukkelijk gepositioneerd als maatschappelijke opgave. Het idee om ‘smart’ te werk te gaan komt daarmee binnen Rijkswaterstaat steeds meer onder druk te staan. Deze huidige blik richt zich voornamelijk op het efficiënter maken van bestaande structuren (interne transacties). Voor de vervangingsopgave zou de blik daarnaast ook meer naar buiten moeten worden gericht (externe transacties). De structuren hiervoor staan nog in de kinderschoenen. Om deze structuren verder te ontwikkelen zijn flinke institutionele investeringen nodig. De vervangingsopgave wordt daarmee, naast een *technisch en financieel vraagstuk*, evenzeer een *institutioneel vraagstuk*.

1. How to deal with existing infrastructure?

Traditional transportation networks such as waterways, railways and highways are confronted with a major challenge: aging assets (Graham & Thrift, 2007). During the upcoming decades vast investments are required to ensure the functionality of these networks (OECD, 2007; IMF, 2014). A major number of assets in these networks has to be renovated or renewed, since these assets reach their end-of-life-cycle. Over the course of the 20th Century, transportation infrastructure systems in western countries have developed towards full, mature networks and an accordingly advanced institutional setting. While initially set-up as small-scale, regional networks, infrastructure systems have expanded into (inter)national networks. Next to the physical development of networks, institutional arrangements have been established to plan and steer networks. For example, national public authorities have typically taken a central role to deliver the need for infrastructure, working with local authorities as well as with land use developers. The development of infrastructure networks, and the surrounding institutional context, has led to increasingly rigid operating systems following sunk costs and vested interests (Bolton & Foxon, 2015). This kind of rigidity could potentially lead to sub-optimally performing networks which are more 'rooted in the past' than tailored to present and future demands (Bertolini, 2007). Hence, according to Frantzeskaki and Loorbach (2010), the profound need for infrastructure renewal can be considered a "window of opportunity" to prevent a lock-in.

This "window of opportunity" is currently being mapped in the Dutch national inland waterway network by several studies (e.g. Van Buuren & Roovers, 2015; Van der Vlist et al., 2016; Willems, 2016). The common element in these studies is in the urgency to operate more strategically and systematically than previously done. For instance, an exploratory study in the Netherlands (see Bernardini et al., 2014) developed a new framework to better decide on the best time period to renew. This framework incorporates also multiple interests from a wider range of stakeholders. It seems, therefore, that infrastructure renewal becomes the instant to reconsider existing institutional arrangements to continue ensuring high-quality infrastructure networks that are aligned to future conditions. However, as Van der Vlist and colleagues (2016: 76) state, the renewal challenge is a new reality with which engineers, operators and policymakers have limited experience so far. Altogether, the central concern for infrastructure renewal is if existing institutional structures still suffice to tackle the renewal challenge, or if new structures need to be developed to change course (Willems, 2016).

Given this dilemma, it becomes crucial to better understand (changes in) institutional arrangements in the light of infrastructure renewal. If we consider institutional arrangements, the public task of realising infrastructure networks has increasingly become a form of collective action between different governmental bodies and private actors. Oftentimes, these actors start to cooperate on a voluntary basis, based on the assumption that cooperation will lead to mutual gains. To illustrate, infrastructure developers and land- and real estate owners alike collaborate to achieve mutual benefits from infrastructures such as roads and waterways. Also regional authorities are increasingly participating in as well as co-funding projects initiated by national infrastructure providers to expand purely transportation aims into integrative plans.

These exchanges and collaborations emerging within these institutional arrangements have led to an inter-organisational system of both public and private parties (Alexander, 1992, 1995). The challenge of infrastructure renewal confronts this inter-organisational constellation: do existing relations and collaborations adequately account for this? More precisely: do we need to smarten these relationships, or is more fundamental institutional change required (cf. North, 2005)?

This article will explore the transformation towards new institutional arrangements addressing infrastructure renewal. We look specifically into the Dutch inland waterway network, since it is a prime example of an aging network in need of major renewal. We aim to provide a framework to better comprehend the motives for moving to institutional structures that are well-tailored for the issue of infrastructure renewal. This framework is derived from a transaction cost economics point of view. After Buitelaar (2004), we consider transaction costs the result of the (re)creation and the use of institutional arrangements. It involves for instance costs that are linked to collaboration and coordination. A transaction cost perspective allows us to assess alternative institutional arrangements (Williamson, 2000), as well as to assess the transformation from one arrangement to another (Marshall, 2013). This article will apply the transaction cost framework to several policies and programmes initiated by the central actor Rijkswaterstaat for the mature Dutch national waterway network. We will examine the feasibility of current and potential arrangements and the obstacles to get to those arrangements.

Our paper, which is still work-in-progress, consists of four parts. Chapter 2 introduces transaction costs economics and its approach to understand (changes in) institutional arrangements. Chapter 3 presents preliminary findings from our study of the Dutch inland waterway network. This chapter discusses two directions that are currently being taken in practice to reconsider institutional arrangements for renewal. The fourth and final chapter reflects on these two directions, and presents a research agenda.

2. A transaction cost perspective on institutional change

2.1 An introduction to transaction cost economics

The development and redevelopment of infrastructure can be seen as a collective decision-making process in which multiple actors are involved. Similar to companies operating in a free market, public administration regularly needs to cooperate with other stakeholders, both public and private, to realise their goals. To structure this decision-making process (to decrease costs and facilitate agreement), institutional arrangements are established (Williamson, 1999b). The focus in an economic institutional approach is to assess these arrangements: instead of examining institutions as technical entities, institutions' alternative organisational forms are investigated (Williamson, 1999a). This theoretical lens assumes that stakeholders will start cooperating voluntarily as they have an internal drive to lower the transaction costs to realise their goals. Institutions can help to decrease these costs. Hence, following Buitelaar (2004), the costs related to the creation and use of institutions are a crucial part of transaction costs.

The transactions that stakeholders have established result eventually in a so-called inter-organisational system (Alexander, 1992, 1995). Williamson (2000) presents a dichotomy of such systems: market versus hierarchy. Infrastructure planning, as an example of collective decision-making, can thus be seen as either “the multiple self-interested decisions through systemic market interactions” (market) or “the development of nonmarket linkages, which generate hierarchical organizations and interorganizational systems” (hierarchy) (Alexander, 1992: 195). If we take a closer look at infrastructure planning, nonmarket structures have emerged since infrastructure planning is a clear example of a task that involves transactions with high costs, as a result of large long-term investments (e.g., financial resources, specific skills and expertise) made in an uncertain world (Whittington, 2012: 273). Accordingly, infrastructure planning is currently regarded a public task, operating in vertically integrated hierarchies (Künneke et al., 2010). Recently, these structures have become more liberalised (Whittington, 2012; Lenferink, 2013). Also more value-driven approaches have been incorporated leading to a wider range of stakeholders involved (Hijdra et al., 2014). These examples demonstrate the underlying rationale of transaction cost economics: inter-organisational relationships are optimised to decrease transaction costs, or – in other words – to address inefficiencies and achieve the highest mutual gains (Kingston & Cabbalero, 2009). A transaction cost perspective, thus, helps to explain why either one of these forms has emerged: what are the motives for starting certain relationships?

In line with Buitelaar (2004) and Marshall (2013), we operationalise transaction costs as the costs associated with the creation and use of institutions. The creation of institutions relates to the efforts required to establish institutions, reflected for instance in regulations and the set-up of public administration. The use of institutions links to processes of actual agreement-making within existing rules. Consequently, transaction costs can be assessed *ex-ante* (creation) and *ex-post* (use) (Marshall, 2013). Both phases can be more specified, as McCann et al. (2005) and Marshall (2013) have done. Their classification of transaction costs follows the policy life cycle and entails eight phases (shown in table 1). The first few phases focus on working towards a shared understanding and, subsequently, towards mutual goals. Effecting these goals results in the creation of institutional arrangements. To guarantee that the arrangements are well-implemented, subsequent phases are oriented towards aspects such as monitoring and enforcement. Ultimately, the institution can be adapted or replaced.

The institution creation and use phase come with different costs. Generally speaking, in the *ex-ante* phase, transaction costs are expected to be higher if the number of actors is high and their viewpoints differ highly (Spiller & Tommasi, 2003; Buitelaar, 2004). The creation phase requires vast investments for up-front learning to bring about experiments and institutional innovations. In the *ex-post* phase, the working out costs of the implementation are initially rather high, but are expected to decrease in subsequent stages because of a learning curve (McCann et al., 2005). Indeed, interaction will be optimised over time leading to more efficient structures.

Table 1: Classification of transaction costs.

Buitelaar (2004); Marshall (2013)	**McCann et al. (2005); Marshall (2013)**	**Examples**
Institution creation ***Ex-ante***	1. Research and information	Defining goals and mapping interests among authorities
	2. Enactment or litigation	Establishing institutions (e.g. regulations, agencies)
	3. Design and implementation	Actual set-up of public administration (e.g. procedures and programmes)
Institution use ***Ex-post***	4. Support and administration	Coordination of procedures
	5. Contracting	Delegating tasks to other parties (e.g. through public-private partnerships)
	6. Monitoring and detection	Monitoring the impacts of procedures and programmes
	7. Prosecution and enforcement	Enforcing the approved procedures
	8. Adaptation or replacement	Adjusting procedures and programmes if appropriate

2.2 Infrastructure renewal: re-assessing institutional arrangements

Typically, transaction cost economists compare alternative institutional arrangements to reveal the most efficient one (Williamson, 2000; Kingston & Cabbalero, 2009). The classification in table 1 can be used to distinguish the costs in two different institutional arrangements. This is visually represented in table 2, in which institutional arrangement A is compared with institutional arrangement B leading to different transaction costs (respectively TC_A and TC_B). As McCann et al. (2005) state, some studies predict the transaction costs *ex-ante* (expected costs), others measure the transaction costs *ex-post* (actual costs). An example of measuring transaction costs *ex-post* is Whittington (2012) who compares transaction costs associated with different contracting types (Bid-Build versus Design-Build) for infrastructure planning.

In addition to comparing arrangements, a transaction cost perspective can also offer insights in institutional transformation. Instead of comparing institutional arrangements, it is then about "effecting change from existing institutional arrangements to a new institutional option" (Marshall, 2013: 189). If we look again at table 2, the movement from institutional arrangement A to institutional arrangement B comes thus with transformational transaction costs ($TC_{transformation}$). These transformational costs entail not only costs linked to effecting change, but also additional costs experienced to overcome lock-ins caused by already existing institutional options (Garrick et al., 2013). Put differently, the transformational costs are driven by push as well as pull factors (Rauws & De Roo, 2011).

First, institutional transition costs (push; $TC_{transition}$) will occur when existing institutions are reconsidered and, in turn, recreated. As a consequence, these costs can be positioned in the creation phases (1-3) (Marshall, 2013). Second, lock-in costs (pull; $TC_{lock\text{-}in}$) relate strongly to "constraints imposed by path dependencies" (Marshall, 2013: 188). The familiarity of existing institutional arrangements might result in preferring existing yet less efficient arrangements over new arrangements (North, 1994; McCann et al., 2005). These cost can be positioned in the eighth phase of adaptation, because this phase corresponds for changing established structures. In sum, the transformation costs ($TC_{transformation}$) are formed by both transitional ($TC_{transition}$) and lock-in costs ($TC_{lock\text{-}in}$) (Marshall, 2013).

Table 2: Moving from one institutional arrangement to another comes with transformation costs.

		A	$TC_{transformation}$	B
Institution creation *Ex ante*	1. Research and information		$TC_{transition}$	
	2. Enactment or litigation			
	3. Design and implementation			
Institution use *Ex post*	4. Support and administration			
	5. Contracting		$TC_{lock\text{-}in}$	
	6. Monitoring and detection			
	7. Prosecution and enforcement			
	8. Adaptation or replacement	+		+
		TC_A		**TC_B**

2.3 Economic and political dimensions of transaction costs

The transformation from institutional arrangement A towards arrangement B is traditionally driven by an objective to lower existing transaction costs as much as possible. A transaction cost economics perspective assumes that parties involved in infrastructure planning are continuously evaluating the costs of their transactions, looking for more beneficial options. To illustrate, public administration assesses more suitable governance arrangements, for instance seen in the search for new contracting forms (Whittington, 2012) and value-creating arrangements (Hijdra et al., 2014). As a consequence, the premise of transaction cost economics is that the most efficient governance arrangements – i.e. those with the minimum transaction costs – will emerge over time. This process is, in the words of Kingston and Caballero (2009: 161), "an evolutionary one in which competitive pressure weeds out inefficient forms".

In addition to the economic aspect of transactions, several researchers have also stressed the political aspect of transactions (North, 1990; Spiller and Tommasi, 2003). Institutional arrangements are not only driven by economising principles, but are also the result of political discussions (North, 2005). These discussions apply even more to public administration (compared to firms). As Covaleski et al. (2003) argue, political discussions can create a rationality that differs from a focus on efficiency. To illustrate, issues related to legitimacy may be at odds with efficiency. It is therefore important to also consider the

political dimensions of transactions, as they seem to define the frameworks within economising on transactions can occur. It is in particular in the early stages of institution creation (see table 1) that these frameworks will be decided upon. Related to this is the notion of path dependency: it requires high investments to move beyond established frameworks (North, 1994). Examples include fundamental issues such as the set-up of public administration and cultural aspects (norms, values) (Feiock, 2007).

2.4 A synthesis

This chapter presented a transaction cost economics framework to examine institutional change. The key assumptions are that institutions are created and used to diminish transaction costs (table 1), and that institutional change will occur when actors identify institutional arrangements with lower transaction costs. Whereas transaction cost economics typically compares alternative institutional arrangements, we also explicitly included the transformational costs needed to move from one arrangement to another (table 2). In addition, we argued that this movement is not solely driven by economising principles, but also by political choice. The transformational costs therefore have both an economic and political dimension. The next chapter will examine institutional structures in our case study of the Dutch inland waterway network.

3. Institutional arrangements for renewal: first experiences from The Netherlands

In our preliminary empirical analysis, we will map established institutional structures which together constitute an inter-organisational system managing the Dutch inland waterway network. Our analysis centres on the public authority Rijkswaterstaat since it can be considered the key actor regarding the development and operation of the waterways in the Netherlands. Our analysis is based on in-depth interviews with senior policy makers from Rijkswaterstaat, the Ministry of Infrastructure & the Environment, as well as from (representatives of) private companies. Our interpretations have been verified with secondary literature (e.g. Bernardini et al., 2014; Van der Vlist et al., 2016). This chapter consists of two parts. We will first introduce the established institutional structures. A reconsideration of these structures has led to two directions which are discussed in the second and third part.

3.1 The current situation

Before we move to an assessment of institutional arrangements, it is essential to get more background information on the planning and operation of inland waterways in the Netherlands. The national inland waterway is one of the oldest Dutch transportation systems. It consists of two main natural rivers (Meuse, Rhine and their branches) and several man-made canals (e.g. Amsterdam-Rhine Canal). The institutional setting surrounding the physical network has changed considerably in the last Century (Willems et al., 2016). Infrastructure provision is essentially considered a public task in the Netherlands, in which the national Ministry of Infrastructure & the Environment takes the lead. In particular its executive agency, Rijkswaterstaat, has been a powerful actor in Dutch inland waterway planning and management (Lintsen, 2002). Originally being the

sole responsible actor, Rijkswaterstaat has moved away from a 'command-and-control' mode of working. On the one hand, it is currently working in close alignment with regional governments and port authorities to construct waterway infrastructure. On the other hand, it has adopted New Public Management thought, leading to a focus on efficiency and effectiveness and more 'market-driven' infrastructure procurement. Reflected in novel contracts, private companies are for example getting more responsibilities for not only constructing infrastructure, but also designing, financing and maintaining infrastructure.

In addressing infrastructure renewal, Rijkswaterstaat has established a strategic vision (*Strategische Visie Vervanging en Renovatie*). The established framework currently consists of four successive steps (table 3). First, the technical departments of Rijkswaterstaat define a prognosis of the end-of-lifecycle of an infrastructure asset. This is not a fixed moment in time, but rather a time period in which the end-of-life-cycle is expected. Based on these prognoses, regional departments of Rijkswaterstaat will advise the national board of Rijkswaterstaat which assets to prioritise in their region. The second step, subsequently, entails the programming of assets in national budget schemes by the board. This has to be approved by the Minister of Infrastructure & the Environment and parliament. Third, assets are officially decided upon and successively clustered in 'tranches' of projects. These tranches, again, have to be approved by the Minister and parliament and, if approved, will be launched in subsequent years. In each tranche, the separate projects will be tendered to private companies. The fourth and final step consists of the actual realisation of the projects.

Table 3: the established framework by Rijkswaterstaat (Van der Vlist et al., 2016).

	Established framework (current)
1	Onderzoeksprogramma en prognoserapport Vervanging en Renovatie (end of life cycle)
2	Programmering en actualisatie van de meerjarenreeks in de Rijksbegroting
3	Beslismoment: opdrachtverlening voor realisatie van V&R-maatregelen per tranche
4	Realisatie

Currently, the public actors involved recognise the urgency to upgrade major parts of the inland waterway network. Multiple assets have been built in the early 20th Century, making studies state that there is a renewal challenge looming. According to several policies and exploratory studies, this challenge requires novel ways of working which current actors are not yet familiar with (Van der Vlist et al., 2016). These documents stress the need to develop long-term, integrative strategies for the complete network (e.g. Bernardini et al., 2014; Willems, 2016). Given this background, our analysis reveals two directions that are currently being taken by Rijkswaterstaat.

3.2 Direction 1: the Programme on Navigation Locks

First, the Programme on Navigation Locks (*Sluizenprogramma*) was launched in 2012. Interviewees have earmarked this programme as an example in which 'renewal experiences' are gathered on the ground. The Programme consists of six major projects: Keersluis Limmel, Beatrixsluizen, Sluis Eefde, Zeetoegang IJmuiden, Afsluitdijk and

Nieuwe Sluis Terneuzen. The upgrade needed together accounts for approximately €3 billion euros. The projects, except for the Nieuwe Sluis Terneuzen, are tendered through DBFM-contracts (Design, Build, Finance, and Maintain).

In general, the Programme aims to invest more 'up-front' which it expects to easily reimburse later. Two main structures are designed to realise infrastructure projects more efficiently. On the one hand, whereas previously major projects were individually approached, a programmatic structure has been created to support learning and knowledge transfer between projects. The programme team is formed by the six project managers and overseen by a programme director. The programmatic structure is assumed to foster predictability and uniformity which will safeguard a smoother realisation of the projects. In the programme, multiple initiatives are launched to foster knowledge exchange between projects. As such, these initiatives result in more internal transactions that result in higher costs. Yet, these costs are said to pay off because projects are more efficiently realised: the overarching goals of the programme are thus more easily achieved. Looking at table 1, we can position these costs to the phases that concern institutional use. To illustrate, the programmatic structure can be seen as an example of support and administration (phase 4).

On the other hand, the Programme aimed also to foster exchanges and collaborations with private companies. Instead of the prevailing motto "the market unless" (*de markt, tenzij*), the Programme opted for working in closer relation with private companies. Rijkswaterstaat was not happy with the outcomes of previous public-private partnerships, reflected in so-called 'fight-contracts' (*vechtcontracten*). On the one hand, the contracting phase was intensified to speak through all potential hick-ups. Private companies considered these additional meetings at first instance too expensive, which led to an adjustment. On the other hand, more generic discussion meetings were organised in a Community of Practice. Although Rijkswaterstaat aimed to make this Community a joint initiative, Rijkswaterstaat remained the main driver behind these events. According to private companies, this was due to the contractor-client relationship that continues to persist. Altogether, in these initiatives to engage more with private companies, the transaction costs are mainly intensified in the phases of institutional use. In particular the contracting phase has been expanded to guarantee no disturbances in latter phases. However, private companies seemed hesitant to invest more in these phases.

3.3 Direction 2: a new strategic vision

The second direction is a reconsideration of the current strategic vision. In 2015, the board of Rijkswaterstaat expanded the *Strategische Visie Vervanging en Renovatie* with three additional steps (table 4). Two issues stand out. First, the advice of the regional boards will increase in importance (see new steps 2 and 4 in table 4). Step 2 in the new vision emphasises the development of regionally coherent strategies: assets should therefore be approached more connectedly. In addition, the new advice should also better account for the opinions and interests of other regional authorities and developers (e.g. provinces, waterboards, port authorities). It is expected that aligning interests among stakeholders will contribute to more coherent strategies. Step 4 builds further on

specific projects and explicitly asks for contributions by other regional authorities, for instance to incorporate other goals related to energy generation and spatial quality.

Second, the decisive moment to include certain assets in the national budget scheme has expanded (step 3 in table 4). In step 3b, it has been made more explicit to choose between existing programming options. The options range from regular maintenance, approved in Service Level Agreements (SLA), to major alterations, for which the MIRT-trajectory exists (*Milieu, Infrastructuur, Ruimte & Transport*). By explicitly distinguishing between options, Rijkswaterstaat hopes that this will lead less to straightforward '1-to-1'-replacement, but to a more comprehensive consideration of the asset in its wider context. As a consequence, it is expected that financial funds will be better allocated.

Approached from a transaction cost perspective, Rijkswaterstaat seems to actively push in their new vision for establishing relationships with external, particularly regional parties. Increasing relationships with parties such as regional authorities will lead to more transaction costs. Yet Rijkswaterstaat expects that these costs will outweigh the mutual gains that can be realised. Accordingly, the net benefit for the renewal or renovation of infrastructure will increase. As Van der Vlist et al. (2016) argue, these alterations – improvements – in the strategic vision will make renovation and renewal not so much a technical discussion driven by end-of-lifecycle prognoses, but also clearly a political discussion. It becomes key to get all regional parties on board to reach mutual gains. The additionally created steps offer the potential to discuss assets more comprehensively, both inside and outside Rijkswaterstaat.

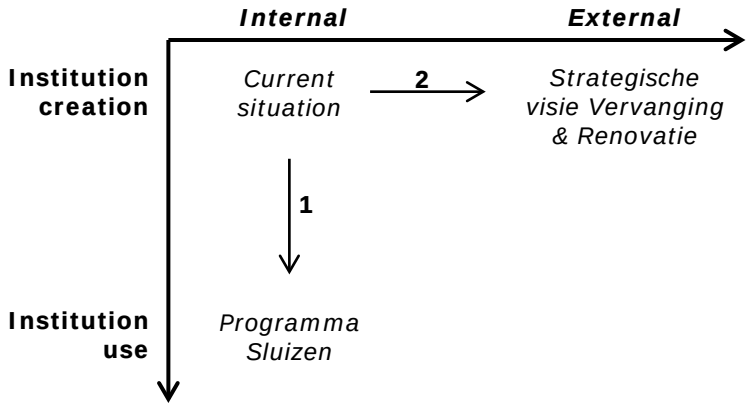
Table 4: the established framework versus the proposed framework.

	Established framework (current)	**Proposed framework in the Strategic Vision Renewal and Renovation (2015)**
1	Onderzoeksprogramma en prognoserapport Vervanging en Renovatie (end of life cycle)	Onderzoeksprogramma en prognoserapport Vervanging en Renovatie (end of life cycle)
2		Analyse en regioadvies
3a	Programmering en actualisatie van de meerjarenreeks in de Rijksbegroting	Programmering en actualisatie van de meerjarenreeks in de Rijksbegroting
3b		Beslismoment 1: 1. SLA (Service Level Agreement) → Regulier beheer en onderhoud 2. 1-op-1 3. Beperkte scopewijziging 4. Grote scopewijziging → MIRT
4		Scopebepaling V&R en opstellen projectraming, planuitwerking of MIRT onderzoek/verkenning/planuitwerking
5	Beslismoment 2: opdrachtverlening voor realisatie van V&R-maatregelen per tranche	Beslismoment 2: opdrachtverlening voor realisatie van V&R-maatregelen per tranche
6	Realisatie	Realisatie

4. Reflections: towards a research agenda

Our preliminary analysis reveals two major directions. On the one hand, existing structures are smartened in which New Public Management thought clearly resonates. The programmatic structures helps to smoothen the use of institutions by allowing for uniformity and predictability. On the other hand, there is space for the re-creation of institutions reflected in the expansion of the strategic vision on renewal and renovation. In particular, more attention is paid to regional authorities and their interests. Mapping these two directions (sketched in figure 1) shows that there are different styles of approaching infrastructure renewal (cf. Van Buuren & Roovers, 2015). It seems that both styles are at odds with each other: arrow 1 in figure 1 has a strong focus on 'smart', whereas arrow 2 openly brings in potential risks due to a higher number of stakeholders involved.

Figure 1: The two observed directions for changing institutional arrangements regarding the national inland waterway network in The Netherlands.



To better understand the institutional context surrounding infrastructure renewal, we distinguish two opportunities for future research. First, the shift from an institutional arrangement that is mainly internally driven toward an arrangement that puts more emphasis on external stakeholders (arrow 2 in figure 1) is associated with higher transaction costs. This move positions the renewal challenge as a socio-institutional challenge: profound institutional change is required to incorporate external stakeholders more. Since transaction cost economics presumes voluntary agreements, stakeholders (e.g. governments, port authorities) have to find mutual benefits to start co-operating. In other words, "what is in it for me?". Whereas internal transactions can be more easily controlled, external transactions are likely to be more risky and uncertain. For instance, getting to shared agreements between the public authority Rijkswaterstaat and regional governments can be time-consuming and costly, and may obstruct individual interests. However, the overall higher public value may be higher. Accordingly, it is needed to gain more insights in the trade-off between pursuing individual interests and getting to shared agreements as well as in the institutional structures that have to be established to allow for finding mutual gains.

Second, the transaction cost framework is now mainly used as a 'heuristic device' (cf. Buitelaar, 2004), rather than a means to fully account for the actual or projected costs. This perspective already helps to reveal the frictions that are accompanied with

exchanges and collaborations. For example, the previous chapter only briefly touched upon transaction costs per phase (as distinguished in table 1). These frictions can be expressed more firmly by quantifying or monetising them. The challenge, then, is the consideration what to include in the quantification: which costs relate to what? This also applies to the transformation costs to move from institutional arrangement A to B, which we now did not discuss in our empirical chapter. Future research could look into institutional barriers and enablers, either qualitatively or quantitatively, that explain transformation.

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