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## Planning for Waterway Renewal: Balancing Institutional Reproduction and Institutional Change

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### ABSTRACT

Modern waterway networks are ageing and need to be renewed, yet the institutional context in the waterway sector is averse to change because of path dependencies. Waterway renewal requires actors to navigate between institutional reproduction and change. Applying an innovative framework for analysing institutions in a case study of the Dutch national waterways, we mainly find instances of institutional reproduction, which turns waterway renewal into a technical and financial exercise. However, institutional change becomes increasingly evident through a new functional-relational path, suggesting that planning for waterway renewal also entails reconsidering novel waterway configurations and incorporating neighbouring spatial developments.

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Institutional change; waterways; institutions; path dependency; infrastructure planning; public administration

## Introduction

Modern waterway networks in the Western world are rapidly ageing. Major components of these systems, such as weirs, bridges, and navigation locks, have reached or are approaching a state of maturity (and partial decline). This development marks a clear need for renewal and renovation (EIB, 2016; Gil & Beckman, 2009; Van Dorsser, 2015). In addition to the technical and climate change-related challenges pertaining to deteriorating waterway infrastructure, societal demands may have altered considerably since the initial construction date. Renewal of waterway networks is presented as a change imperative: the focus of organisations responsible for infrastructure planning shifts from developing to redeveloping networks (Bolton & Foxon, 2015; Graham & Thrift, 2007; Kanter, 2015). However, previous research has demonstrated that the costs embedded in waterway infrastructure and institutions have created a context that is rigid and resistant to change (Banister, Anderton, Bonilla, Givoni, & Schwanen, 2011; Farrelly & Brown, 2011). This context may, in turn, create a situation in which both the physical infrastructure and the social institutions become 'locked in' in past configurations that do not consider current and future conditions, such as changing societal demands, decreasing public funding, and climate-related water stresses (Willems, Busscher, Hijdra, & Arts, 2016).

In order to anticipate and address a change imperative such as major waterway renewal, the central concern for planning research and practice is the organisation of collective action

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(Alexander, 2005). This organisation is conditioned by institutions, since they operate as “the humanly devised constraints that structure political, economic and social interaction” (North, 1991, p. 97). Institutions can be both formal (laws, regulations) and informal (social conventions, norms). At the same time, institutions are the outcome of the organisation of collective action (Giddens, 1984). As Mahoney and Thelen (2009, p. 4) argue, institutions are often treated as enduring features that resist change. Institutions are inherently conservative and self-reinforcing: this characteristic is their strength, yet also their weakness (Gupta et al., 2010). Hence, institutions embody an interesting paradox: whereas institutions are typically regarded as entities bringing predictability and stability, anticipating change and dynamism might put these entities under pressure. Indeed, change imperatives such as waterway renewal may well call for ambiguity, change and dynamism – elements that can be far from predictable and stable. In the light of the anticipated waterway renewal, we have noted a research gap concerning the agency of actors to bring about institutional change.

Emphasising the agency of actors in institutional theories at critical moments (Salet, 2018; Sorensen, 2010) enables us to analyse how and why institutional change is initiated. Actors have the ability to enhance processes of institutional reproduction (i.e. exploiting existing practices) and processes of institutional change (i.e. exploring new practices) (Mahoney, 2000; March, 1991). We aim to understand how actors perceive the critical juncture in waterway planning and which institutional change actors find feasible. To analyse institutional change in waterway planning, we focus on agency and institutional dynamics from two key streams of institutionalism (new institutional economics and socio-constructionist institutionalism). We will analyse institutional change in the context of the highly mature Dutch inland waterway network currently undergoing a major transformation. The Netherlands has proven forward-looking regarding waterway planning (OECD, 2014) and its institutional setting is well-established and well-documented (Arts, Filarski, Jeekel, & Toussaint, 2016; Lintsen, 2002). Consequently, the Dutch waterway management system presents a perfect case for exploring processes of institutional change in waterway renewal.

The structure of this article is as follows. The next section offers a dynamic, actor-centred perspective on institutions, based on the notion of path dependency. This theoretical section works towards a framework for assessing actors’ motivations for institutional reproduction and change from two institutional perspectives. The third section discusses the methodology and introduces the case study of the Dutch national inland waterway network. The fourth section presents the findings from both institutional perspectives in our case study, along with their implications for waterway renewal. The final section presents the conclusions and discussion.

## Theoretical Framework

### *A Dynamic Perspective on Institutions: Path Dependency*

Institutions condition actors to respond either positively or negatively to change imperatives (Gupta et al., 2010). Actors may ignore the change and discard it as irrelevant, or they may incorporate the change, setting in motion a process of institutional change. Institutions typically hinder anticipating change because they function as stable fixtures structuring interactions between individuals, groups and organisations through self-reinforcing mechanisms (DiMaggio & Powell, 1983; Mahoney & Thelen, 2009). The self-reinforcing nature of institutions is stressed in the concept of path dependency. According to Sorensen (2015, p. 21), “[t]he core idea of ‘path dependence’ is that, once established, some institutions tend to become increasingly difficult to change over time, and so small choices early on

can have significant long-term impacts". Originally, the concept of path dependency was applied to explain 'lock-ins' in technical systems (Arthur, 1994; Unruh, 2000); currently, the concept is also widely applied to the social sciences (Mahoney, 2000; Pierson, 2000) including the field of planning (Bertolini, 2007; Sorensen, 2015).

Path dependency does not imply that institutions are fixed or that rigidity is the sole potential outcome. Rather, path dependency implies that changes are structured by conditions (Sorensen, 2015). Actors will either follow or challenge established paths, leading to either a mechanism of institutional reproduction or a mechanism of institutional change (Figure 1; Mahoney, 2000). As noted by March (1991), both mechanisms are essential for institutions to cope with change, which is a complicated balancing act. Tensions may arise between elements aiming to bring stability, and those looking for experiment and novelty. Thus, actors need to navigate between *reproduction* and *change*.

This ability becomes even more important at critical junctures. In the development of infrastructure networks, a phase of renewal can be considered such a juncture, which marks the need for re-considering the functionality of the system (Bolton & Foxon, 2015). Sorensen (2010, p.281) describes critical junctures as "exceptional times when agency can play a much larger role in challenging existing institutions and establishing new policies that may in time become institutionalized". Hence, pursuing either institutional reproduction or institutional change at these moments will have profound implications for the future of the infrastructure network.

### *Different Path-Dependent Explanations from New Institutional Economics and Socio-Constructionist Institutionalism*

If we want to analyse the tensions that arise from actors pursuing either institutional reproduction or change, we need to further conceptualise how institutions are enacted by actors in practice (Healey, 2007; Salet, 2018). Multiple conceptualisations for institutions as well as methodologies for researching institutions have been proposed under the umbrella term of new institutionalism (Hall & Taylor, 1996). The new institutionalism can also be witnessed more and more in planning research (Kim, 2011; Verma, 2007).

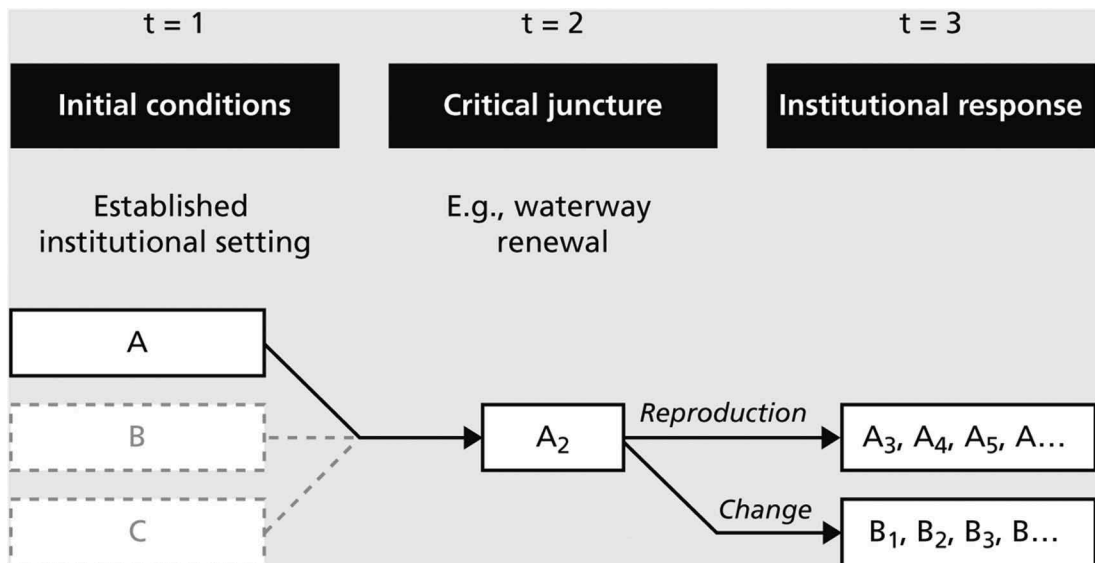


Figure 1. Path dependencies (adapted from Mahoney, 2000; see also Matthews, 2013).

Following DiMaggio (1998, p. 620), we can distinguish two major streams of institutionalism on the basis of their theoretical orientation: a lens rooted in new institutional economics (NIE), and a lens rooted in social-constructionist institutionalism (SCN) (for similar distinctions, see Buitelaar, Lagendijk, & Jacobs, 2007; González & Healey, 2005; Inderberg, 2011). Though the streams have different theoretical (ontological) orientations, they share rather similar origins. On the one hand, both lenses argue that institutions operate in human interactions as both enabling and constraining factors (Salet, 2018). On the other hand, both lenses treat institutions as endogenous factors that can actively be created and re-created by actors (Kim, 2011). Both NIE and SCN have developed distinct research traditions for analysing agency and institutional dynamics, in which the mechanisms of reproduction and change are operationalised in different ways (Mahoney, 2000). NIE presumes that institutions are inter-organisational arrangements, which actors will re-create if this is in their self-interest based on voluntary rational choice. In contrast, SCN considers institutions as cultural signifiers to which (groups of) actors can relate; actors will re-create institutions if they are considered inappropriate. Table 1 provides an overview of the two different perspectives on institutional change. Linking the two perspectives offers a complementary account of institutions, considering the logic of both instrumentality and appropriateness (Buitelaar et al., 2007). The NIE-lens predominantly considers how actors rationally seek efficient formal organisational arrangements, while the SCN-lens complements these findings with actors looking for appropriate, often more informal types of institutions.

### *New Institutional Economics: A Logic of Instrumentality*

The lens rooted in NIE presumes that the interactions between organisations to anticipate waterway renewal come with extra costs in addition to production costs (Williamson, 1998): organisations will have to invest in getting to know each other and reaching agreement. NIE assumes that organisations are internally driven to lower transaction costs. In theory, over time, more efficient transactions will arise, as organisations are expected to act rationally and to seek utility maximisation (Hall & Taylor, 1996; Williamson, 1999). The transactions are governed by a system of organisational arrangements (Williamson, 1998). These arrangements can be regarded as “a means to an end” that help organisations to efficiently attain their sets of objectives (Inderberg, 2011, p. 305). Clearly defined rights of ownership are expected to result in an improved inter-organisational coordination and distribution of responsibilities, with corresponding lower transaction costs. Consequently, the new institutional economics follows a logic of instrumentality to smooth exchanges between organisations. This perspective regards planning in terms of individuals voluntarily making joint decisions. To smooth their transactions, individuals

**Table 1.** A framework to research institutions from two lenses.

	New Institutional Economics (NIE)	Socio-Constructionist Institutionalism (SCN)	Source
<i>Key focus</i>	Institutions are <i>organisational structures</i> that smooth human interactions in order to achieve specific ends	Institutions are <i>cultural signifiers</i> that shape human interaction, visible in shared attitudes, norms and values	Hall and Taylor (1996) and Inderberg (2011)
<i>Understanding institutional change in practice</i>	Institutions are assessed by individuals against a <i>logic of instrumentality</i>	Institutions are assessed by individuals against a <i>logic of social appropriateness</i>	March and Olsen (1989) and Williamson (1998)
<i>Research approach</i>	Analysis of actors' considerations in their search for efficient organisational structures by assessing the different transaction costs	Analysis of actors' views on appropriate cultural signifiers through interpretative research rooted in a socio-constructionist worldview	Hall and Taylor (1996) and González and Healey (2005)

establish organisational arrangements, which, in the extreme, may result in either hierarchical organisations (through internalising activities) or a free market system (Alexander, 2001).

From this perspective of voluntary choice, organisations continuously monitor their transaction costs to improve efficiency. A key assumption is that as long as current arrangements cost less than alternative arrangements, current organisational structures will be reproduced. Institutional change will only occur when maintaining the established arrangements is no longer in the organisation's interest. Such a change is driven by a different cost-benefit trade-off, derived from the evaluation of institutional performance (Mahoney, 2000) – in our case ensuring a well-functioning waterway system. However, organisations tend to focus on the here and now and neglect the long term and the bigger picture (Levinthal & March, 1993). Consequently, following Williamson (1999, p. 1105), transaction cost economics assumes that “previously unrecognised regularities” will be detected by organisations along the way as these patterns affect organisational performance, and that these considerations will subsequently lead to instrumental improvements in organisational arrangements, so the impact on organisational performance will be mitigated.

### *Socio-Constructionist Institutionalism: A Logic of Appropriateness*

The lens rooted in SCN is a cultural approach that examines “the socially embedded process of institutionalisation” highlighting dialogue over decisions (Buitelaar et al., 2007, p. 895). This perspective sees institutions, not as instruments for achieving certain goals more efficiently, but rather as operating as frameworks of meaning. Institutions thus serve a logic of social appropriateness, instead of a logic of instrumentality (March & Olsen, 1989). The logic of appropriateness is expressed through shared belief systems and practices, demonstrating that the ‘rules of the game’ are embedded in a wider culture (Hall & Taylor, 1996). Discursive approaches in which language plays a central role are often used to get a grip on the shared belief systems (Meyer & Rowan, 1977; Van Hulst & Yanow, 2016). Organisations jointly construct meaning, thus determining the appropriate actions. This meaning-making process results in discourses that allocate meaning to social and physical phenomena reflected in a set of practices (Van Hulst & Yanow, 2016). Dominant discourses condition the interactions between organisations through a logic of appropriateness. As a result, planners have become aware of how the wider historical-institutional context (as visible in public norms, for example) conditions specific planning practices (González & Healey, 2005).

As previous research has shown, organisations tend to comply with established discourses, a process referred to as institutional isomorphism (DiMaggio & Powell, 1983). Meyer and Rowan (1977, p. 348) argue that this compliance demonstrates how organisations legitimise their existence by adhering to societal values that define what is considered appropriate. This inclination operates as a strong driver for the mechanism of reproduction (Mahoney, 2000). Discrepancies between prevailing belief systems may challenge the dominant institutions, which subsequently could set institutional change in motion. Such discrepancies can spring from actors' changing belief systems, expressing different central concepts. Ultimately, these changes may result in the breakdown of one discourse and another taking its place. Planning research, however, has mainly shown instances of incremental institutional change, in which institutions adapt more slowly to new circumstances (Healey, 1998).

### *A Synthesis*

**Table 2** summarises the two lenses and their perspectives on institutional reproduction and change. In both strands, agents drive the mechanisms of change: institutional change is affected by either

**Table 2.** The two institutional strands offer different explanations for institutional reproduction and change (adapted from Mahoney, 2000).

	Mechanism of reproduction	Mechanism of change
NIE: <i>Logic of instrumentality</i>	Rational cost-benefit trade-off (lowering transaction costs)	New insights leading to new trade-off: challenging the instrumentality
SCN: <i>Logic of appropriateness</i>	Reconfirming appropriateness; 'compliance to the norm'	Changes in the values of actors: challenging the appropriateness

new organisational trade-offs, or by changes in organisations' belief systems (Mahoney, 2000). The framework presented in Table 2 helps to understand the motivations regarding why and how either institutional reproduction or change is favoured by actors.

## Methodology

Both institutional strands focus on the agency of organisations to modify established institutions. In our analysis, we highlight how actors from key organisations approach waterway renewal and to what extent they perceive current institutions as both instrumental and appropriate. Waterway renewal is defined as a critical juncture (see Figure 1), which, when it occurs, is a suitable opportunity for reflecting whether established institutions in waterway planning still suffice. Our analysis allows us to identify how actors pursue mechanisms of reproduction and change from two perspectives (Table 2). We have examined actors' motivations in the context of a case study of the Dutch inland waterway network, which will be introduced first.

## Introduction to the Case Study

The Dutch national inland waterway network is among the oldest transportation networks in the Netherlands. Many components, such as weirs, locks and bridges, were built in the 1920s and 1930s (Van Dorsser, 2015). In addition, a review of academic literature on the case study (Arts et al., 2016; Lintsen, 2002; Van den Brink, 2009) shows the path-dependent nature of the Dutch waterway network, due to a firmly established institutional setting dating back to the Napoleonic era (late 18<sup>th</sup> century). Originating from that time, the Dutch Constitution establishes the state's responsibility to make the land suitable for human habitation and to protect and improve the living environment. Providing infrastructure is a public task in the Netherlands. The Ministry of Infrastructure & Water Management spends approximately 2.5% of the Dutch GDP on infrastructure development, management and operation annually (Statistics Netherlands, 2016). This has led to the development of institutions in which the national government has the right of ownership to develop infrastructure. For instance, the government-led authority Rijkswaterstaat was founded in 1798 to develop and operate the waterways across the Netherlands. At present, Rijkswaterstaat is the executive arm of the national Ministry of Infrastructure & Water Management. The Ministry and Rijkswaterstaat are the main parties responsible for the national waterways. Due to decreasing public funding, the national government is investigating co-financing arrangements with regional and local governments. Strict legal procedures for infrastructure investments necessitate consultation with regional and local stakeholders (see Arts et al., 2016). This consultation was typified by the OECD (Organisation for Economic and Co-operative Development) (2014, p. 17) as "a distinctive 'polder approach', which values concerted, consensus-based decision-making". The national government has traditionally been the most powerful national actor in waterway development, exerting full control. This is exemplified by the central role Rijkswaterstaat played in the formation

of the Netherlands (Lintsen, 2002), which has created a discourse that values technical expertise and made waterway management mainly an affair for engineers (Arts et al., 2016; Van den Brink, 2009). Recently, with the integration of new functions such as ecology and recreation (related to the Integrated Water Resources Management), the national government has been repositioned as an initiating or facilitating actor, leaving more room for other parties to pursue their waterway-related interests (Hijdra, Arts, & Woltjer, 2014). These other parties are primarily public bodies, such as regional and local governments, but may also be private parties (e.g. container terminals, surrounding land-use owners, farmers). Despite the emergence of new institutions, the established institutional setting remains dominant. To illustrate, the Dutch national Council for the Environment and Infrastructure recently concluded that a sectoral way of working, occupied with realising new transport capacity, still prevails in Dutch planning practice (Council for the Environment and Infrastructure, 2018).

The current waterway network is ageing and requires major upgrades (Deltaprogramma, 2012; EIB, 2016; Van Dorsser, 2015). For example, 52 out of 137 navigation locks require renewal before 2040 (Rijkswaterstaat, 2015). The increased number of ageing assets has prompted a search for new ways of working that will guarantee a well-functioning system in which the organisations involved may have new roles to play (Van der Vlist, Roovers, & Barneveld, 2016). In our study, this search is regarded as an excellent opportunity for actors to reflect critically on the established institutions: do the organisations involved believe that current institutions suffice in a context of waterway renewal? And if not, how should the institutions be altered following the logics of instrumentality and appropriateness?

### *Data Collection and Analysis*

To examine which institutional change actors believe is required for Dutch waterway renewal, we conducted 23 interviews in two rounds. We interviewed senior officials working for key organisations in the waterways, such as the Ministry of Infrastructure & Water Management, its executive agency Rijkswaterstaat, regional governments (provinces), the logistic sector and port authorities, knowledge institutes, consultancies and construction companies (see [Appendix 1](#)). Each interview consisted of a reflection on current practices and interactions in concrete waterway examples and projects. The goal was to reveal existing institutions and to create a discussion on (required) changes in these practices. All interviews were audio-recorded and transcribed. Summaries were sent to the interviewees for confirmation.

The practices and interactions mentioned in the interview transcripts were interpreted and translated into established institutions and proposals for modification of these institutions. The qualitative data computer programme Atlas.ti was used to code the transcripts. All interviews were coded twice: first from the NIE-perspective; then from the SCN-perspective. Concerning NIE, right of ownership is a defining concept (e.g. the right to use or modify the waterway), which is reflected in the legal responsibilities (mandates) and financial structures. To operationalise SCN, the shared belief system and practices were further divided according to content (what are the key values and practices in the culture?), roles (which roles do the parties have to play and why?) and argumentation (is the culture based on coherent and consistent reasoning?) (Fisher, 1997). As such, the coding process started with a deductively constructed code tree with two families of institutional structures and cultures.

We defined actors' views of the institutions at two moments in time ([Figure 1](#)). As we were examining a highly advanced institutional setting, the established institutions according to actors



were taken as the initial conditions ( $t = 1$  in [Figure 1](#)). Waterway renewal is operationalised as the critical juncture ( $t = 2$ ), at which moment actors will assess if institutions can still be considered instrumental and appropriate ([Table 2](#)). This assessment may trigger both institutional reproduction and institutional change ( $t = 3$ ). Institutional reproduction is considered in a continuation of rights of ownership and dominant discourses, institutional change in proposed changes in rights and discourses. Our findings show what will take place: institutional reproduction, institutional change or both.

## Actors' Views on Institutional Change for Renewal in the Dutch National Inland Waterways

This section presents the empirical findings regarding actors' views on institutional reproduction and institutional change in the Dutch national inland waterways triggered by waterway renewal. The following sub-sections discuss the findings from the NIE-perspective (in which actors are driven by a logic of instrumentality) and the SCN-perspective (in which actors are driven by a logic of appropriateness) respectively (summarised in [Table 3](#)).

### Actors' Views On Instrumental Institutions

#### Initial Conditions: Current Institutions

All interviewees confirmed that providing infrastructure is considered a public task in the Netherlands. For instance, as interviewee #3 from the logistics sector puts it, the national government has a duty to cater for smooth inland navigation and water safety. The right of ownership lies with the national government, more specifically the Ministry of Infrastructure & Water Management (responsible for policy-making) and its executive agency Rijkswaterstaat (for the day-to-day operation). The right of ownership is reflected in the national government's responsibilities to safeguard the primary aims of the waterways, i.e. ensuring waterborne transportation and guaranteeing water discharge for water safety purposes. Interviewees state that the national government's overarching objective for the waterways is to maintain a system that does not fail these tasks. As interviewee #9 argues, "[*maintaining an advanced system*] is quite a challenge in itself". Although the national government has full control, the Ministry is obliged to consult with regional and local parties on investments in the waterways. Other parties that intend to use or modify the waterways rely on the national government, as the Ministry has to approve their plans.

The existing institutions ( $t = 1$  in [Figure 1](#)) developed to secure current waterway performance to maximise utility, can be typified as formal and hierarchical, with clear responsibilities for each party (captured in legal and financial agreements). Every year, the Ministry approves the national infrastructure budgets, which are derived from the national Infrastructure Fund (for transportation such as highways and waterways) and Delta Fund (for the national water system) (Arts et al., 2016). These funds run until 2030, with allocated budgets for infrastructure construction and maintenance. According to interviewee #5, who works for the Ministry, the construction budget is expected to resolve the major bottlenecks in the transportation systems before 2030, based on current scenarios. In addition, there are funds for maintenance and operation, which executive authority Rijkswaterstaat uses to ensure smooth operation of the transportation system. This budget category includes renewal and renovation (I&M, 2017).

Waterway renewal has been operationalised as a task primarily for the infrastructure operator. Organisational arrangements between the strategically-operating Ministry and its implementer

Rijkswaterstaat streamline the allocated funds. Over time, the responsibilities and exchanges have been formalised and institutionalised. As a result, interviewees #5 and #14 perceive the transaction costs as relatively low, as the parties know each other well and the aims are clear. As considerable budgets are involved, accountability to parliament is important. The process is streamlined in strict procedures that prescribe responsibilities and budget allocations between the Ministry and Rijkswaterstaat. Given that Rijkswaterstaat as the operator has more hands-on knowledge, the Ministry tries to overcome information asymmetries, for instance by commissioning Rijkswaterstaat to deliver an overview of the technical state of the waterway network to the Ministry every two years. The executive agency underscores that renewal is mainly a technical exercise. Interviewees argue that the need for consultation with other parties is limited, since renewal often does not lead to altered or new functionalities. A Rijkswaterstaat employee (interviewee #13) specifies that:

“All kinds of infrastructure assets in the national inland waterway system are reaching their technical end-of-life-cycle. We just ask [the Ministry] for money to replace those assets. That is the common procedure, which remains within the technical domain.”

To conclude, the NIE-perspective reveals that actors perceive institutions focusing on the budget and technical issues as instrumental. Consequently, the organisational arrangements centre on the Ministry and Rijkswaterstaat and do not have much political influence, so transaction costs are perceived as low.

### *Critical Juncture: Instrumental Institutions for Renewal*

For waterway renewal ( $t = 2$  in [Figure 1](#)), the public task of providing infrastructure is not questioned. Interviewees argue that, if the infrastructure starts deteriorating, the national government has a responsibility to continue (or even upgrade) current performance levels. The right of ownership remains unaffected. The growing importance of waterway renewal has incited Rijkswaterstaat to start several exploratory studies. These studies can be considered a reflection on existing institutions and have led to new insights and demands on how to approach renewal.

The project Renewal Challenge Hydraulic Works (in Dutch: *Vervangingsopgave Natte Kunstwerken*) and an exploratory study on the Meuse river (*Grip op de Maas*) have raised awareness that replacing waterway assets on a one-to-one basis might lead to a ‘lock-in’ of the current waterway system with dated functionalities. As a Rijkswaterstaat interviewee (#20) argues, replacing assets one by one “*implies that (...) the [waterway] system configuration will also function for the long term, that it is durable.*” Interviewees became aware that waterway renewal is not purely related to maintenance. As interviewee #13 illustrates with an example:

“[The asset] is part of a waterway system, which has been designed for [specific purposes]. By now, these purposes have changed. So you want to replace [an asset] for a dated objective... Shouldn’t we take a closer look? Well, that was not commonplace.”

This quote demonstrates that various alternatives for renewing waterway assets may exist, besides simply replacing them. As a result, renewal discussions acquire a political dimension that questions existing functionalities. In addition, functionalities such as recreation, energy generation, and ecological issues are increasingly incorporated into waterway planning. Waterway renewal is no longer only the sole responsibility of the operator Rijkswaterstaat. Other parties are also getting involved. Thus, actors put the instrumentality of current institutions into question, marking a shift from technical, hierarchal organisational arrangements towards more functional, relational arrangements.

Interviewees propose several modifications of established institutions to move away from an arrangement in which the Ministry and Rijkswaterstaat take the lead. The first modification relates to the funding source. At the moment, the Infrastructure and Delta Funds only provide funding for one-to-one renewal from the maintenance budget (Figure 2). For additional functionalities, new funding sources have to be found. Interviewee #4 from the Ministry indicates that the Ministry has gained experience with co-financing water system projects with fellow governments, for instance in the national Delta Programme (*Deltaprogramma*) and the Flood Protection Programme (*Hoogwaterbeschermingsprogramma*) in which national and regional governments operate together. A similar approach is taken in the transportation sector which follows the national programming, planning and budgeting (PPB) framework of key Dutch national infrastructure projects. This framework encompasses the Multi-Year Programme for Infrastructure, Land Use and Transport (*Meerjarenprogramma Infrastructuur, Ruimte en Transport*) and translates strategic transportation policies into specific national projects. The PPB-framework extensively describes the rules of the game for national and regional parties to negotiate and decide upon either the construction of new infrastructure or the renewal of existing infrastructure (see Arts et al., 2016).

Positioning waterway renewal in the national programming, planning and budgeting framework creates a new institutional setting, in which the Ministry (and its executive agency, Rijkswaterstaat) is no longer the only player responsible. Transactions between different levels of government become the core focus. The Ministry has declared that it is willing to discuss regional

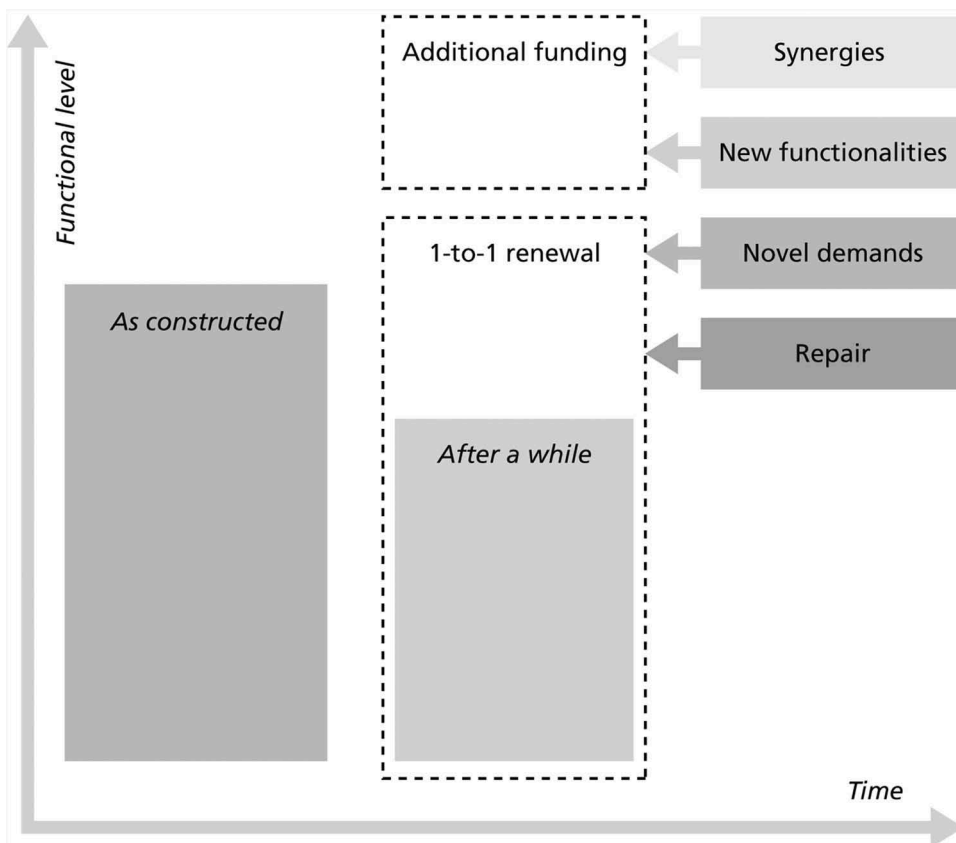


Figure 2. Renewal as perceived by the Ministry of Infrastructure & Water Management (adapted from I&M, 2016).

initiatives, as interviewee #4 demonstrates: *"You can link [your ambitions to ours] and participate. But if you want to join, you'll have to contribute financially, too."* Even so, these discussions take place within certain boundaries (rights of ownership), as national interests can overrule regional ambitions: *"If you want to arm wrestle, you shouldn't do that with us of course."* (interviewee #4) Some (though not yet all) provinces see an opportunity to connect regional ambitions to national renewal projects. As interviewee #8 from a province explains, *"If you have ambitions [as a province], you have to take your responsibility. And in financial terms, too."* The latter two quotes illustrate that discussions can easily turn to finances (Figure 2). Although the Ministry argues that it is best for other parties to join this new 'game', regional parties feel that the sectoral (transportation) angle is still dominant, since the Ministry is constricted by fixed budgets and can overrule regional parties. A Ministry employee confirms: *"Only when there are great ideas [from regional parties] can we explore whether we can expand our budget. It does not work the other way around."* (interviewee #4) Moreover, the new arrangements currently operate in a rather informal way and, according to interviewee #10, strongly rely on regional political ambitions. As a consequence, arrangements become more open, yet also appear more ad hoc.

In these new political arrangements, Rijkswaterstaat has difficulty defining its responsibility. Interviewees from Rijkswaterstaat perceive themselves as operators with the ability to raise issues with the Ministry. A consultant (interviewee #1) observes that Rijkswaterstaat likes to attend negotiations within the national PPB-framework as a neutral party (the operator as the expert that other parties can consult with), but regional governments consider Rijkswaterstaat a representative of the Ministry. As interviewee #16 from Rijkswaterstaat confirms, *"We are not independent."* Being one of the parties at the table, Rijkswaterstaat is also less familiar with combining its own interests with those of the others, as the agency considers its own interests of higher national importance. For example, interviewee #12 argues: *"[Rijkswaterstaat] should not suddenly allow activities that may harm the way our waterway network currently functions. You have to be very alert in that respect, (...) or else you'll devalue your own system."*

Regional and local governments gain more responsibilities and are often represented by the Dutch provinces. Whereas some provinces are active in connecting waterway developments with regional economic development (e.g. Overijssel, Noord-Brabant), others are more hesitant or even unaware of the possibilities. Interviewee #7 from the latter group of provinces argues that the Ministry should initiate waterway (re-)development programmes which regions can join later. However, the Ministry takes a similar perspective in waiting for regional initiatives because, according to interviewees #4 and #5, waiting will reveal what certain projects are really worth to the regions. Other regional parties, such as semi-public agencies (e.g. energy companies), can participate in renewal developments, but so far, their contributions can be seen only in small-scale pilots initiated by the national government.

Private parties have not experienced great changes in their responsibilities. To illustrate, interviewees #2 and #22 (from the logistics sector and water construction companies, respectively) argue that they remain fully dependent on the national government, as waterway development remains a public task. The interviewees acknowledge that they have good connections within the national government, so they can raise potential concerns.

As the division of responsibilities becomes more messy (and is still under discussion), approaching waterway renewal within the national programming, planning and budgeting scheme with a view to including more functional discussions about the waterways, may add to the ambiguity. This approach may increase transaction costs between parties. As interviewee #1 observes, *"It is likely that a mismatch will arise between the agendas and rhythms of the different parties"*. At the same time, the playing field is still undefined: interviewees have different views on what is most

instrumental. Various views underline the different operationalisation of utility maximisation, which has changed for some by broadening the goal of renewal. Still, reasserting the dominant path, a group of interviewees question to what extent the PPB-framework is suitable for renewal and whether the current organisational arrangements already suffice. These existing institutions are currently expanding (thus slowly changing) with an explicit assignment to inventory potential renewal options that adhere to the national PPB-framework, as seen in Rijkswaterstaat's updated strategic vision on renewal and renovation (I&M, 2016).

To conclude, institutional change occurs through extending the dominant organisational arrangements as the outcome of new insights and demands (Table 3; t = 3 in Figure 1): in addition to a technical focus (a result of institutional reproduction), a functional perspective (institutional change) has emerged that is presented by actors as more instrumental with the potential to approach waterway renewal in a more comprehensive fashion that includes national and regional actors. However, the functional perspective has yet to be explored in practice.

### *Actors' Views on Appropriate Institutions*

For the SCN-perspective, we re-constructed institutions that actors find appropriate based on content, roles and argumentation. As with the previous section, we looked at current institutions and institutions for renewal.

#### *Initial Conditions: Current Institutions*

Interviewees identified the reliability of the waterway system for the main users (shipping) as a central concept in the discourse on waterway renewal. Smooth operation of the waterway network is appropriate, as reflected in specific performance levels (e.g. navigation locks have to be available 98% of the time) that are set by the Ministry of Infrastructure & Water Management and with which its executive authority, Rijkswaterstaat, has to comply. To illustrate the focus on performance, interviewee #4 refers to former minister Karla Peijs (2003–2007) who often emphasised how important it is to “maintain what we have got” (in Dutch: *“houwen voor bouwen”*). From this perspective, ageing infrastructure could challenge the performance of a waterway network. As infrastructure ages, *“more attention is being paid to regular maintenance and renewal.”* (interviewee #5).

Emphasis on performance has clear implications for the management of the network. The main player, Rijkswaterstaat is responsible for preserving access. According to interviewee 9, *“A typical operator is rather conservative, it is someone who just wants to get it right. So (s)he will always rebuild what was there, as (s)he knows it was of good quality.”* In other words, a proven system should be maintained. Interviewees from Rijkswaterstaat perceive themselves as apolitical and rational experts: *“We have become an executive agency and as a result [we have been placed] outside of the political domain. (...) We are judged on reliability.”* (interviewee #19) Rijkswaterstaat translates the objectives from the Ministry to specific performance indicators (e.g. ‘service level agreements’) and projects resonating new public management thinking with ‘value for money’ principles. In this respect, Rijkswaterstaat relies on its technical knowledge base, explained by interviewee #1:

*“[This reliance on technical knowledge encompasses] a feasibility or steerability way of thinking of Rijkswaterstaat. You can construct a completely rational system [with] performance indicators which you then translate for the different branches that you have to manage, but I do not believe in that approach.”*

To summarise, the institutions that actors regard as promoting appropriate actions are risk-averse, rationality-driven and somewhat conservative ( $t = 1$  in Figure 1). In this discourse, Rijkswaterstaat plays a central role.

Within the context of waterway renewal, a culture has emerged which reasons that if an asset in the waterway network reaches its technical end of life, it will be replaced to safeguard performance. Interviewee #14 explains:

“When a piece of infrastructure no longer functions, and so technically is written off, well, you’ll have to make an investment to bring the asset back to its previous level. The goal is then linked to maintaining the current waterway network.”

As Rijkswaterstaat is in charge, the regional stakeholders had limited awareness of the emerging issue of waterway renewal and the Ministry did not initially perceive renewal as its responsibility. Interviewee #12 states that “[Renewal] is a task that is on the agenda of Rijkswaterstaat as the responsible operator and maintainer of the waterways.” This perception is reinforced because renewal issues are programmed by Rijkswaterstaat within the available budgets (Figure 2).

### *Critical Juncture: Appropriate Institutions for Renewal*

In view of many waterway assets needing renewal, interviewees still consider a focus on performance and reliability as appropriate, but expanded with novel, additional concepts. According to interviewee #13, the focus has been too much on minor, technical elements (the “nuts and bolts”) and on isolated objects. Instead, interviewees would prefer to include wider developments. For instance, interviewee #14 states:

“Being able to provide additional input based on what you see in regard to the functionality [of the waterway system], and in regard to the surroundings? What do I have to take into account? That [question] is really new.”

These issues all relate to the current configuration of the network. As a result, a shift in content and argumentation can be observed: what is considered appropriate is extended to the notion of functionality. With this concept, waterway renewal becomes not just a way to maintain the current system in order to safeguard performance, but also an opportunity to integrate different developments and to transform the waterway network. For instance, interviewee #8 argues that renewal is an opportunity for his region to boost the current regional economic situation.

In this discourse, in which actors stress the possibilities of transforming the network, the parties involved are developing new roles. The Ministry of Infrastructure & Water Management, for instance, aims to move away from its prescriptive role. According to interviewee #4, “[Taking the lead] is a position we do not want so much anymore. Others just lean back, they think that it is the national government’s turn, they will pay, so we do not have to think about renewal.” Instead, the Ministry is looking for initiatives shared with regional and local governments to create widely supported waterway renewal plans. Still, the Ministry remains a dominant player: “We obviously have a clear role, as we are the party with the large sums of money. (...) Without us those major infrastructure projects cannot proceed.” (interviewee #4) Also, the Ministry stresses that initiatives need to be sober and effective. Other parties wanting to participate in renewal projects have to contribute financially, as budgets are limited (see Figure 2). There must be a clear synergy and, with infrastructure on the cusp of breaking down, there is a clear time horizon before plans and projects have to be finalised.

On the regional level, the province as the regional government, considers itself a linking force that can bring together varied interests. Provinces are already familiar with this role from having had to deal with many cases involving adjacent land use. Provinces argue that they often know their region better than the Ministry or Rijkswaterstaat. Interviewees distinguished two types of provincial roles. Some provinces take a traditional 'wait-and-see' stance. Only once the national government has launched a plan for their region will provinces lobby to incorporate their regional interests in the plan. For them, the Ministry remains a "black box" (interviewee #7) which "is still operating from its ivory tower in The Hague" (#8). Other provinces are pro-active and often have ambitious regional development agendas. For instance, interviewee #10 from the province of Overijssel states: "We are actively looking to expand the renewal challenge to logistic opportunities for Overijssel. (...) How can we achieve more economic growth to benefit from [renewal] as much as possible?" Provinces actively approach the national government with their ideas, often backed by a regional lobby of either businesses or citizens' initiatives. Since provinces typically provide additional financial resources, synergy with national ambitions can be created. Currently, the pro-active stance seems to be favoured by the Ministry.

The interviewees have less clear ideas about a possible role for Rijkswaterstaat. On the one hand, Rijkswaterstaat is commissioned by the Ministry. As the Ministry argues, "We have to keep Rijkswaterstaat focussing on [functional issues], too." (interviewee #5) On the other hand, Rijkswaterstaat has most of the expert knowledge on the waterway system as the agency handles its day-to-day operation. Discussions between the Ministry and regional governments can lead to novel configurations of the waterway system; Rijkswaterstaat will basically have to comply with the outcomes. Interviewee #20, working at Rijkswaterstaat, argues: "Anything is possible, but we are responsible for the system." Rijkswaterstaat's focus on the operation of the network may clash with functional negotiations by the Ministry and regional governments. Here, a discrepancy can be observed between the established, risk-averse discourse of reliability and the emerging discourse that is opportunity-driven and open to new initiatives.

In this emerging stream, a relatively different belief system around appropriateness has developed in which actors emphasise that the larger picture should be taken into account. From this perspective, renewal is not just a technical issue, but relates to the waterway system (what do we want to do with the waterway system and the surrounding region? – an object-related question) and to parties' aims (who to involve? – a more process-related question). As interviewee #6 observes, "Other parties were in the comfortable position of complaining about Rijkswaterstaat and the Ministry, but that does not hold anymore." Nevertheless, the national government remains powerful as it has both the largest budget (Ministry) and the expertise (Rijkswaterstaat). To conclude, institutional change is slowly occurring, and the concept of appropriateness is being expanded by actors, by incorporating a more functional, relational understanding of waterway renewal in an addition to the operator-dominated perspective (Table 3; t = 3 in Figure 1).

**Table 3.** Institutional reproduction and change in the Dutch inland waterway network.

	Mechanism of reproduction	Mechanism of change
NIE: <i>Logic of instrumentality</i>	Advancement of a technical approach, financed by regular maintenance budgets; Ministry and Rijkswaterstaat are leading actors → <i>Transactions oriented towards the here and now</i>	Rise of a new functional and relational approach: using the PPB-framework for co-financing with national and regional parties → <i>"Broader" transactions oriented towards the long term and the bigger picture</i>
SCN: <i>Logic of appropriateness</i>	Continuation of an operator-dominated (i.e. Rijkswaterstaat) culture that takes a technical perspective on waterway renewal  → <i>Actors espousing the dominant discourse</i>	Emergence of a more strategic, functional discourse that questions current waterway configurations with wide stakeholder involvement  → <i>Actors questioning the dominant discourse with novel concepts</i>

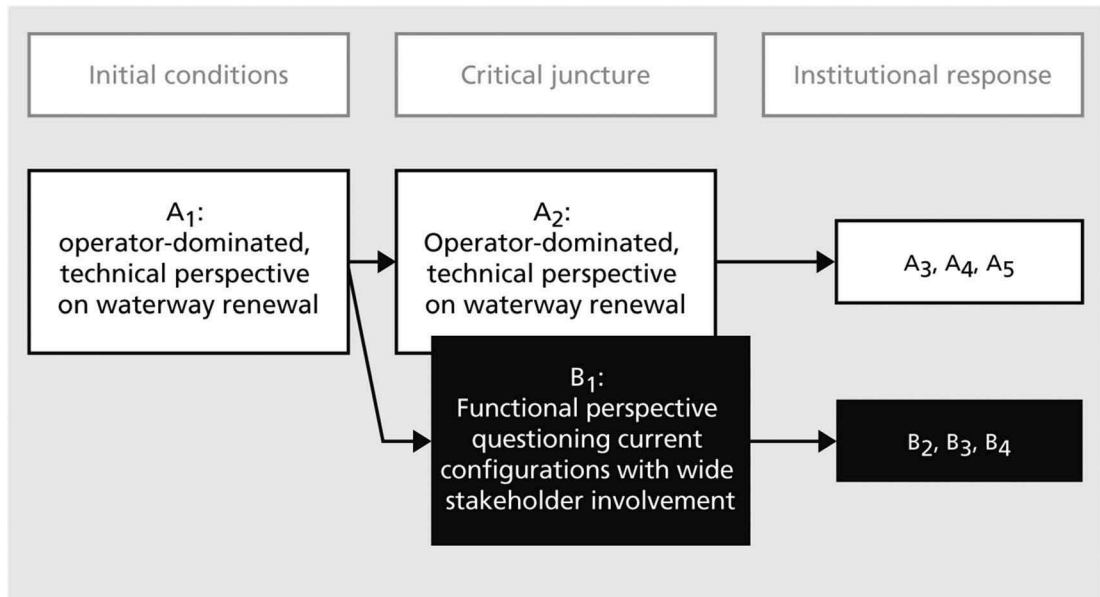
## Conclusions and Discussion

With waterway networks in the Western world ageing, waterway renewal has become a change imperative for redeveloping and transforming networks to meet current and future demands. For waterway planning and management, renewal brings up strategic considerations of what we want to do with mature networks. The aim of our article was to understand from two different institutional perspectives how actors perceive the change imperative of anticipating waterway renewal and which institutional change actors find feasible. We see institutions not as stable entities – although they are often depicted as such – but rather as dynamic entities that actors can re-create. The literature on path dependency demonstrates how anticipating change can be strongly conditioned by established institutional paths. On these paths, both institutional reproduction and institutional change occurs. For the successful anticipation of waterway renewal, actors need to navigate between reproduction and change – i.e. exploit current practices and explore new ones (March, 1991).

We have developed a framework that enables identification of these two mechanisms as approached from new institutional economics and socio-constructionist institutionalism. The approaches presume different motivations as to why either institutional reproduction or institutional change is chosen. For new institutional economics, actors are driven by a logic of instrumentality; in the socio-constructionist institutionalism, actors adhere to a logic of appropriateness (Table 2). We explored actors' motivations from both institutional angles in a case study of the Dutch national inland waterway network. Our results demonstrate that newly established transactions consider the longer term and wider regional developments leading to different trade-offs; new interpretations not only include technical aspects of the ageing infrastructure but also examine its functionality (Table 3). Still, in line with previous research (Banister et al., 2011; Farrelly & Brown, 2011), we find that existing institutions largely condition how waterway renewal is approached. This indicates that the balance between institutional reproduction and change is currently tipping towards the former. Accordingly, actors perceive discarding existing institutions as not instrumental and inappropriate, and rather opt for modifying and complementing them with new institutions to make them 'work'. Thus, new institutions are emerging, which Mahoney and Thelen (2009) refer to as institutional layering.

The implications for planning practice are a broadening of approaches to waterway renewal (Figure 3). The analysis from both theoretical perspectives shows that, in addition to the dominant path (A in Figure 3), a new path is emerging (B). Indeed, we have observed a shift from approaching renewal as a technical and financial issue (focused on isolated objects) towards an issue that requires functional-relational discussions related to wider system implications. In our case, these discussions aim to enhance the coherence between national infrastructure investments and regional spatial developments, for instance through exploring potential synergies. Thus, the technical-hierarchical way of working was seen by interviewees as inappropriate, since renewal requires larger-scale discussions about the future of the waterway network. Likewise, with this broader scope in mind, the instrumentality of the existing institutions was considered inadequate. Interviewees argued that, depending on the size of waterway assets, either a more technical or a more functional approach may be followed. A reconsideration by actors of the logics of instrumentality and appropriateness thus leads to a diversification of approaches to renewal. For planning theory and practice, these findings demonstrate that actors deliberately aim to bring about institutional change to tailor institutions to a new situation. As existing institutions are mainly complemented by new ones, institutional change in our highly institutionalised case study





**Figure 3.** Institutional layering in the Dutch inland waterway system for waterway renewal.

proves to be an incremental process. Given the exploratory nature of our empirical work, future research can further ground these findings.

More generally, our research indicates that institutional change is accelerated once actors deliberately put the dominant logics of instrumentality and appropriateness under pressure. This finding raises the question of whether planners have the capacity to enhance mechanisms for institutional change. Since institutions tend to reinforce themselves, questioning established institutions does not come easy. Our case study of the institutional setting in the Dutch inland waterway network was no different in that respect. The questioning of institutions – and proposed modifications to institutions – often stays within the realm of exploratory studies yet to be raised in actual practice. Our findings reconfirm the vested interests in both the waterway infrastructure and the institutions in which the national government plays a leading role (e.g. in terms of right of ownership and being the main financial contributor). Both institutional perspectives offered different insights for agents pursuing institutional change. From a new institutional economics perspective, actors began to re-create institutions once they observed promising co-financing arrangements between different levels of governments. From a socio-constructionist institutionalism perspective, established institutions were perceived as inadequate, because their focus was considered too ‘engineeristic’. Hence, new institutions that stress functional-relational aspects were developed. Together, both institutional perspectives offer clues as to how more integrative forms of waterway planning can be achieved. From both perspectives, institutional change can be fostered through the incorporation of multiple stakeholders, either through co-financing arrangements (perceived as more efficient than ‘siloe’d’ policy processes) or through functional-relational discussions in which a wider array of stakeholders participate (perceived as more appropriate than a mono-functional, engineering focus). Cases of infrastructure renewal are likely to appear more in the future, with questions about institutional change becoming more apparent. Our case study is an initial examination. Future research may further substantiate the role of change agents in effectuating institutional change.

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## Appendix 1. List of interviewees

#	Position	Organisation	Location	Date
1	Senior consultant/Lecturer	Antea Group/Saxion University of Applied Sciences	Deventer	13-10-2016
2	Head of Nautical & Technical Affairs	BLN-Koninklijke Schuttevaer (Union for shippers)	By telephone	16-11-2016
3	Secretary	Dutch Union of Inland Shipping	By telephone	15-11-2016
4	Deputy head water policy and safety	Ministry of Infrastructure & the Environment	The Hague	24-05-2017
5	Deputy head inland waterways transport division	Ministry of Infrastructure & the Environment	The Hague	08-11-2016
6	Head of Operations	Port Authority Amsterdam	Amsterdam	18-01-2017
7	Senior advisor water and spatial development	Province of Gelderland	Arnhem	12-12-2016
8	Senior advisor mobility	Province of Noord-Brabant	Den Bosch	11-01-2017
9	Programme leader asset manager	Province of Noord-Holland	Haarlem	09-05-2017
10	Senior advisor freight transportation and logistics	Province of Overijssel	Zwolle	05-01-2017
11	Programme manager	Province of Overijssel	Zwolle	05-01-2017
12	Senior advisor network development	Rijkswaterstaat	Utrecht	05-10-2016
13	Senior advisor	Rijkswaterstaat	Utrecht	08-11-2016
14	Senior advisor asset management	Rijkswaterstaat	Utrecht	21-11-2016
15	Advisor nautical affairs	Rijkswaterstaat	Arnhem	12-12-2016
16	Senior advisor	Rijkswaterstaat	Den Bosch	11-01-2017
17	Senior advisor network development	Rijkswaterstaat	Rotterdam	17-01-2017
18	Senior advisor network management	Rijkswaterstaat	Rotterdam	17-01-2017
19	Special advisor asset management	Rijkswaterstaat	Zwolle	29-05-2017
20	Special advisor adaptive water management/Associate Professor	Rijkswaterstaat/Wageningen University & Research	Utrecht	28-06-2017
21	Senior scientist asset management	TNO Research institute	Delft	03-11-2016
22	Director	Union of Water Constructors	Den Haag	13-10-2016
23	Lecturer/Senior consultant	University of Technology Delft/Mercurius Shipping Group	Delft	17-10-2016