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RESEARCH ARTICLE

# Power struggles in policy feedback processes: incremental steps towards a circular economy within Dutch wastewater policy

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**Abstract**
Environmental problems are usually not tackled with path-departing policies but rather with incrementally adjusted or unchanged policies. One way to address incremental change is the policy feedback approach, which initially focussed on self-reinforcing feedback and path-dependency. Today, self-undermining feedback is also increasingly being studied, centring on agency and change. However, it is unclear precisely how actors use power in policy feedback processes. Therefore, this study applied a power perspective and the policy arrangement approach to a case study of the reorientation towards a circular economy in Dutch wastewater policy between 2008 and 2018, which resulted in incremental instead of fundamental policy change. Here it was observed that self-undermining feedback was generated from 2008 onwards but the balance quickly shifted back to self-reinforcing feedback, indicating that the analysed power struggles led to incremental change. These dynamics resemble a shift from the so-called paths and forks (i.e. fork in the road) towards the boomerang pattern (i.e. returning to its original position) of policy change. The patterns are explained by focussing on powerful actors that resist change through the use of incremental reforms, the ongoing struggles of these actors in facilitating self-reinforcing feedback and the role of interpretation in using feedback as a resource. Overall, this study provides a nuanced understanding of incremental change by directing attention to the power struggles of actors in policy feedback processes. For practitioners, the study emphasises the importance of power struggles in enabling a circular economy.

**Keywords** Policy feedback · Politics · Wastewater · Circular economy · Transition

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## Introduction

In 2019, the European Commission published the Green Deal and articulated its intention to develop a low-carbon and circular economy for Europe by 2050. Member states are expected to develop elaborate plans to reach intermediate goals by 2030. Although the goals for the next decades are challenging, the policy progress has been rather limited in terms of achieving these long-term sustainability objectives (EEA, 2019a; UN Environment, 2019). According to the European Environment Agency, 'Europe will not achieve its 2030 goals without urgent action during the next 10 years to address the alarming rate of biodiversity loss, increasing impacts of climate change and the overconsumption of natural resources' (EEA, 2019b). From a policy sciences perspective, this raises the intriguing question of why policy—even under the pressure of long-term catastrophic tendencies—remains unchanged or changes only incrementally.

One way to address this question is the policy feedback approach. It is concerned with the understanding of stability and change by inquiring how established policies influence politics and how the politics subsequently shape policies. This approach is typically used to emphasise path-dependency and self-reinforcing feedback (or positive feedback) (Pierson, 1993). However, recent studies have also focussed on self-undermining feedback (or negative feedback) that may result in policy change and, therefore, also inquired how actors influence policy feedback processes (Béland & Schlager, 2019; Sewerin et al., 2020).

By examining a case study of a shift from self-undermining towards self-reinforcing policy feedback, resulting in incremental instead of fundamental policy change, this study seeks to explore such incremental change by focussing on the power struggles of actors in policy feedback processes. The struggles of actors were recently highlighted by several policy feedback researchers (Béland, 2010; Dagan & Teles, 2015; Haelg et al., 2020; Jacobs & Weaver, 2015; Moore & Jordan, 2020; Schmid et al., 2019). Béland (2010) confirms that existing policies shape the behaviour of actors but suggests that additional research is needed to understand how actors embrace alternative ideas to challenge existing policies and induce change. Similarly, when policymakers perceive the consequences of established policies as negative, they may search for alternative ideas and create new coalitions for change (Jacobs & Weaver, 2015). Furthermore, multiple overlapping self-reinforcing and self-undermining feedback processes make certain policy changes more likely but the interpretation and use of this feedback by actors is crucial for the final outcome (Moore & Jordan, 2020). When taken together, these contributions give us an idea of the role of actors in generating policy feedback, particularly in self-undermining policy feedback. However, more research is required to elucidate exactly how actors use power to fuel policy feedback dynamics.

This study attempts to address this gap by considering an existing perspective on the power struggles of actors in policy processes (Arts & van Tatenhove, 2004) and the policy arrangement approach (Leroy & Arts, 2006), which resembles the so-called policy regime (Howlett & Ramesh, 2003; May & Jochim, 2013). The broad goal of Arts and van Tatenhove (2004) is to evaluate the interaction between actors and the structural context (a particular policy arrangement and long-term trends). In turn, the policy arrangement approach focusses on the established technology, powerful actors, rules of the game, dominant discourses and resources of an arrangement and is particularly useful to identify what has changed or remained stable in these dimensions over time. Both frameworks help in understanding the following feedback processes: the influence of an established policy arrangement on the power struggles of actors and the subsequent effect on the original policy

arrangement. Accordingly, the research questions posed in this study are how actors use power in policy feedback processes and, more specifically, how this results in incremental instead of fundamental policy change.

Thus, as a case study, we selected the reorientation of the Dutch wastewater policy arrangement towards a circular economy between 2008–2018, in which we observe a shift from self-undermining towards self-reinforcing feedback dynamics, leading to incremental instead of fundamental change. The network and knowledge centre called the Energy & Resource Factory was crucial in this process as it aims to enable a transition towards resource recovery from wastewater. Generally, wastewater policy arrangements are characterised by inertia, which is induced by cost efficiency and large-scale infrastructure (Ampe et al., 2019; Fuenfschilling & Binz, 2018; Kiparsky et al., 2016). However, pressing challenges such as energy use, decaying infrastructure, drought and intense periods of rainfall, emerging pollutants and depletion of critical resources (EEA, 2019c; UN WWAP, 2017) have led to innovative activities focussing on a circular economy (e.g. Guest et al., 2009; Lema & Suarez, 2017; van Loosdrecht & Brdjanovic, 2014). In the Dutch wastewater policy arrangement, these challenges also shape activities centred around a circular economy (e.g. Blankesteijn, 2019; van Leeuwen et al., 2018). As such, the general stability of wastewater arrangements (i.e. likely to function as strong self-reinforcing policy feedback) and the challenges and innovative activities (i.e. likely to facilitate self-undermining policy feedback) make the circular economy in the Dutch wastewater policy arrangement a suitable case for exploring the power struggles of actors in policy feedback processes.

By applying the two frameworks to the case study, our study contributes to the understanding of policy feedback by generating novel insights about the power struggles of actors in feedback processes. Using existing frameworks that are not directly related to the policy feedback literature, the study also systematically engages with theoretical and conceptual discussions in other studies about agency and actors, which was an approach recently suggested for policy feedback researchers (Sewerin et al., 2020). The study also empirically grounds feedback processes with an in-depth, qualitative case outside of the overwhelming focus on the USA and social policy (Béland & Schlager, 2019; Kern & Rogge, 2017; Roberts et al., 2018). For practitioners involved in enabling a circular economy, the focus on power also highlights a different way of understanding the potential beginnings of a circular economy.

The remainder of this paper is organised as follows: the "Policy feedback and the power struggles of actors" section focusses on policy feedback and the power struggles of actors. The "Methodology" section introduces the analytical frameworks, research techniques and the case study. The "Empirical analysis" section presents the empirical analysis of the Dutch wastewater policy arrangement around the year 2008, the power struggles in 2008–2018 and, finally, the arrangement in 2018. The "Discussion" section discusses the analysis and the "Conclusion and future research" section concludes the study and provides suggestions for future research.

## Policy feedback and the power struggles of actors

In this section, we describe the conventional understanding of policy feedback. We elaborate on self-reinforcing and self-undermining feedback, particularly on the power struggles of actors in policy feedback processes, which will be explored in the subsequent sections through the application of an established power perspective and the policy arrangement approach to our case.

Drawing inspiration from Pierson's (1993, 2000) work on path-dependency and self-reinforcing dynamics, the policy feedback approach focusses on understanding policy stability and change. Specifically, it investigates how an existing policy influences political processes and how these politics subsequently feed back into policy over time (Jordan & Matt, 2014; Sewerin et al., 2020). Established policies influence the allocation of resources and the capacities, interests and preferences of actors involved in politics, which affects subsequent policies. For example, during the Second World War, the social security policy involved challenges but it was protected by powerful lobbies and interest groups, leading to the expansion of this policy from the 1950s onwards in the USA (Béland, 2010; Béland & Schlager, 2019). Thus, over time, existing policies may create their own bases of political support that lead to self-reinforcing dynamics and stability.

As such, it is argued that when self-reinforcing feedback from past choices accumulates, it generates a powerful cycle of increasing returns that may become path-dependent over time, hindering path-departing change. More precisely, an existing policy may create lock-in effects that are generated by fixed costs, the development of particular skills, the coordination of activities in social and economic networks and the adoption of prevailing standards and expectations (Pierson, 1993). These increasing returns arguments were drawn on economic theories and subsequently extended to politics by directing attention to a few factors conducive to increasing returns, namely collective action and organisational persistence, institutional constraints, political authority and the complexity of politics (Pierson, 2000). Although Pierson indicates that the concept of increasing returns does not imply a 'frozen social landscape' but continuous change as well, the policy feedback approach has predominantly emphasised self-reinforcing feedback, leading to a rather narrow understanding of policy change or, more critically, the understanding of policy stability rather than processes of policy change.

Recently, self-undermining feedback has been increasingly studied (Béland et al., 2019; Daugbjerg & Kay, 2020; Jacobs & Weaver, 2015; Millar et al., 2020; Weaver, 2010). In contrast to the self-reinforcing feedback effects of existing policy, the study of self-undermining feedback focusses on the effects of existing policy that gradually undermine the policy. Specifically, Weaver (2010) shares the perspective that past policy choices influence politics but argues that most policy regimes produce self-undermining feedback, influencing the political, fiscal or social sustainability of the regime. Such self-undermining feedback may take the form of problems that are recognised at the outset as well as slowly developing consequences of the policy, which may result in new political demands and subsequent changes in the original policy.

Weaver (2010) then focusses on the balance between self-reinforcing and self-undermining feedbacks to identify different patterns of policy regime change: strong self-reinforcing effects which prevent any exit from the policy regime (labelled as cul-de-sac); strong self-undermining effects and the absence of policy regime choices, in which the policy regime is abandoned and replaced by a new one (labelled as chutes and ladders); moderately strong self-reinforcing effects and constrained choices dictated by the original regime (paths and forks); mixed patterns because of the characteristics of the policy regime; and delayed self-reinforcing effects that initially permit choice but then force reversal (boomerang). However, Weaver (2010) suggests that these policy change patterns are not only influenced by the balance between self-reinforcing and self-undermining feedbacks. They also depend on the availability of incremental patches or reforms that constrain changes and help to maintain the existing policy regime as well as on the existing regime transition opportunities, which may be politically unfeasible, considerably expensive and blocked by powerful actors.

As policy feedback literature is increasingly sensitive to the interaction between self-undermining and self-reinforcing feedbacks, it also directs more attention to the role of actors in feedback processes (e.g. Béland, 2010; Jacobs & Weaver, 2015; Jordan & Matt, 2014; Moore & Jordan, 2020; Sewerin et al., 2020), leading to the identification of several mechanisms through which politics can facilitate or block change. In a study on a policy instrument to reduce emissions from new cars, the absence of strong self-undermining feedback is clarified by showing that car-manufacturers took active political steps to intentionally steer the instrument towards incremental adjustments in their technologies. Here questions also arise about how to evaluate the agency in policy design while considering more structural commitments to incumbent technology (Jordan & Matt, 2014). In a case on health-care reform in the USA, Jacobs and Weaver (2015) identify three mechanisms under which self-undermining feedback is likely to emerge, namely unanticipated negative outcomes for powerful actors, strategic behaviour and expansion of the set of imaginable policy alternatives. Concerning the latter, they note that when the consequences of the existing policy are interpreted as negative, politicians, bureaucrats and experts may search for alternative ideas and create new coalitions for fundamental change, generally highlighting 'the agency of political actors in the politics of policy change' (Béland & Schlager, 2019, p. 190). However, these actors are also dependent on the opening and closing of windows of opportunity (e.g. electoral factors) within a specific institutional setting (Jacobs & Weaver, 2015). Similarly, as the black box around self-reinforcing processes is opened, it is found that institutions, resources, ideas as well as agency and structure matter in feedback processes: 'Supporters and opponents may not take the feedback effects of preexisting policies as given, but may instead actively seek to amplify or suppress such effects, to the extent feasible within institutional constrains' (Patashnik & Zelizer, 2013, p. 1083). Furthermore, in a case on the Emissions Trading System of the EU, it is demonstrated that feedback makes certain policy options more likely but the outcome also depends on the role of actors in the social construction of feedback, particularly on how feedback is interpreted and used as a resource by these actors (Moore & Jordan, 2020). They can draw attention to the consequences of policy to facilitate policy undermining feedback but this requires overcoming powerful cognitive, organisational and political obstacles when this feedback is not anchored in shared understandings and formal institutions (Dagan & Teles, 2015).

Hence, these examples illustrate the relevance of focussing on the role of actors in policy feedback processes as existing policies affect their behaviour. However, additional research is needed about how these actors embrace alternative ideas to challenge existing policy and induce change. Specifically, 'the relationship between the agency of actors, existing policy legacies, and institutional change' (Béland, 2010, p. 583) requires more attention in policy feedback research. Therefore, we focus on how actors use power in policy feedback processes. As such, the next section elaborates on the policy arrangement approach, a power perspective, the research techniques and the case study.

## Methodology

### Two analytical frameworks—one analytical approach

The study aims to investigate how actors use power in policy feedback processes. Therefore, we develop an analytical approach that consists of two analytical frameworks. We use

the policy arrangement approach to describe the original policy arrangement and the new policy arrangement in a comparative perspective and thus to detect change or stability over time. In turn, a power perspective helps to analyse how the power struggles of actors are influenced by the original policy arrangement and influence the new policy arrangement, particularly assessing how these struggles strengthen the original arrangement (i.e. self-reinforcing feedback) or undermine this arrangement (i.e. self-undermining feedback).

First, the policy arrangement approach defines a policy arrangement as 'the temporary stabilisation of the content and organisation of a particular policy domain' (Leroy & Arts, 2006, p. 13). A policy arrangement resembles the so-called policy regime, which captures 'how policy institutions, actors, and ideas tend to congeal into relatively long-term, institutionalized patterns of policy interaction' (Howlett & Ramesh, 2003, p. 234). Similarly, an arrangement consists of four interrelated dimensions, namely the actors involved in the policy domain, the rules of the game (ranging from informal norms and routines to formal legislation and guidelines), the dominant discourse (i.e. interpretive schemes, ranging from formal concepts to popular storylines) and the resources (e.g. knowledge, money and personnel) of the actors involved. As the wastewater system comprises large infrastructure, we included technology as the fifth dimension of an arrangement because it is likely to influence the policy arrangement (Hughes, 1989; Pierson, 1993). Fundamental change in policy arrangements or regimes involves substantial changes in the content, organisation and institutionalised patterns of policy interaction, whereas incremental change does not affect the basic contours of an arrangement and comprises, for instance, the introduction of an adapted discourse while maintaining the other dimensions of an arrangement (Arts & Leroy, 2006; Howlett & Ramesh, 2003). Hence, the policy arrangement approach helps to analyse how the original policy arrangement feeds back into a new policy arrangement over time, particularly by describing the two arrangements in a comparative perspective to detect change or stability.

Second, Arts and van Tatenhove (2004) introduced a perspective to analyse multiple layers of power in policy practices, which was subsequently used and adapted (e.g. Ampe et al., 2021; Avelino, 2017; Grin, 2010; Hoffman, 2013; Kok et al., 2021; Liefferink, 2006; Paredis, 2013; Ramírez-Monsalve & van Tatenhove, 2020). This power perspective focusses on change and stability in policy practices by acknowledging the influence of actors and of the structural context in which these actors operate. Power is then defined as 'the organisational and discursive capacity of agencies, either in competition with one another or jointly, to achieve outcomes in social practices, a capacity which is however co-determined by the structural power of those social institutions in which these agencies are embedded' (Arts & van Tatenhove, 2004, p. 347).

Arts and van Tatenhove (2004) distinguish between three types of power: structural, relational and dispositional power. Structural power refers to contextual processes of structural political and social change such as increasing environmental concerns or macroeconomic processes. These slowly changing trends (i.e. longue durée) are beyond the direct influence of the actors involved in policy practices and appear to be autonomous. However, these actors may derive structural power from these trends by interpreting and mobilising them. Relational power is the capacity of agents to achieve outcomes in day-to-day interactions. Actors can be creative and can act differently in innovative activities by constructing counter-discourses to name and frame certain societal problems as policy problems as well as by mobilising resources such as knowledge, tactics, persuasion, money and personnel to formulate and realise their most desirable outcomes. Nonetheless, avoiding a voluntarist approach, Arts and van Tatenhove (2004) note that human action is highly routinised and that the capacity of

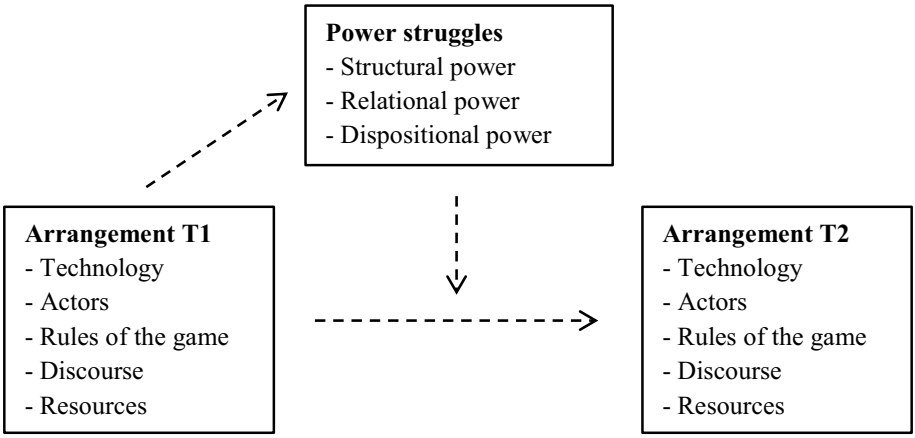


**Fig. 1** Schematic summary of the analytical approach

agents is co-determined by dominant policy practices and the associated rules of the game, resources and discourses. Correspondingly, dispositional power is the power that derives from the positions that actors occupy in a specific situation (e.g. in established policies or an organisation). This process of positioning is mediated by actor configurations, the rules of the game, discourses, resources and, following Hoffman (2013), artefacts such as technology and infrastructure. As such, because of their position, some actors are better able than others to make use of the resources available; they can more easily use rules to achieve an outcome and they have more legitimacy when drawing on a particular discourse. Mediating dispositional power, established actors, rules, discourses, resources and artefacts thus position policy practices in a specific manner: existing policy practices will be privileged, whereas novel policy practices may be constrained by resistance and stability. Yet pressures induced by novel policy practices and slowly changing trends may affect this process of positioning which, for example, leads new actors to challenge certain rules to enable innovative policy practices (Grin, 2012). Thus, the dynamics between these three layers of power influence change and stability in policy practices and, in our case, a policy arrangement.

In our analysis, we first use the policy arrangement approach to describe the five dimensions of a particular policy arrangement at a certain time (T1). We then consider the three types of power as conceptualised by Arts and van Tatenhove (2004) to investigate how the power struggles of actors are influenced by the original policy arrangement T1 (indicated in Fig. 1 with the arrow pointing from arrangement T1 to power struggles) and influence the arrangement over time, generating self-reinforcing and self-undermining dynamics (indicated in Fig. 1 with the arrow pointing from power struggles to the arrow that connects arrangement T1 and T2). Specifically, we assess how these struggles strengthen the original arrangement (i.e. self-reinforcing feedback) or undermine it (i.e. self-undermining feedback). Finally, we provide a new description of the five dimensions of the new policy arrangement at the second point in time that we observe (T2). By doing so, we can detect where and to what extent change has occurred or is ongoing in the arrangement. Figure 1 summarises the components of the analytical approach.

## Research process and techniques

In the process of selecting a case, choosing a conceptual and analytical approach, collecting empirical material, coding and analysing, we followed an abductive approach, which is embedded in an interpretive methodology (Durnová & Weible, 2020; Schwartz-Shea & Yanow, 2012). In abductive reasoning, 'an (often surprising) single case is interpreted from a hypothetic overarching pattern, which, if it were true, explains the case in question […] During the process, the empirical area of application is successively developed, and the theory (the proposed overarching pattern) is also adjusted and refined' (Alvesson & Sköldberg, 2009, p. 4). As such, we first heard about the Energy & Resource Factory's role in enabling a circular economy in the Dutch wastewater policy arrangement in the beginning of 2017, particularly in interviews with a few wastewater experts at a university in a previous study. In turn, prior knowledge about the Dutch wastewater sector and preliminary field observations helped to obtain a general notion of the policy arrangement and our interpretations were regularly adjusted by alternating between the different types of literature, frameworks and empirical material (see "Appendix" for a list of the interviews, observations, field notes, documents, videos and newsletters).

In the first half of 2018, we conducted 10 (out of 15) face-to-face expert interviews. The interviews included established actors and innovators and were selected by purposive and snowball sampling (Yin, 2016). The in-depth interviews lasted 60–150 min and began with personal histories and roles in the Dutch wastewater sector, after which we gradually focussed on the circular economy in the Dutch wastewater sector, the most important actors, events and trends, and enabling and constraining elements in introducing the circular economy. In doing so, we were guided by the perspective of the interviewees. Eight meetings related to the Energy & Resource Factory were also joined in 2018 to observe the activities of the innovators and the established actors, which were documented in field notes. Furthermore, multiple events on resource recovery from wastewater were visited in 2017 and 2018 to complete the analysis. These observations helped to contextualise the interviews and documents. At this time, we selected the most relevant documents collected during the field work, which were mainly used to complement the information obtained from the interviews.

The first author of this study used the MAXQDA software to analyse the empirical material in an abductive manner. In the first round of coding, ten interviews were codified into 1192 text fragments, which were assembled into five broad categories: developments in the sector (i.e. sustainability, circular economy, austerity, the reputation of the regional water authorities and so forth), dimensions of the arrangement, external drivers and the activities of innovators and established actors. In the second round of coding, we (re)coded (1366 text fragments) these interviews by introducing the three layers of power to the coding scheme.

In the five additional interviews, the second part/hour usually focussed on the dynamics between the so-called sandboxes and efficiency (see "Empirical Analysis"), which were important topics that emerged from the previous interviews and the coding process. Next, a detailed version of the analytical framework was introduced to the coding scheme and the interviews were (re)coded, whereas the documents were coded for the first time (3469 text fragments). At this time, the coding scheme comprised codes on the developments in the sector (see above) as well as the dimensions of the two arrangements and the three types of power in two phases (see "Empirical Analysis"), meaning

that the first author had an overview of who used power why, when and how. By the end of 2018, we stopped the collection of empirical material as no additional information was obtained in the interviews, documents and observations.

## Case study

Dutch wastewater policy is part of wider water management that is carried out by the following public actors: the European Union, international river basins commissions, the Dutch Ministry of Infrastructure and the Environment and its executive agency, provinces, municipalities and the regional water authorities. In addition, numerous institutes, advisory committees and companies also shape water policy, whereas the presence of NGO's is rather limited (OECD, 2014). Dutch water management focusses on three main functions (Havekes et al., 2015; Lazaroms & Poos, 2004): flood control is the responsibility of the national government and the regional water authorities and encompasses the management of dams and dykes; water quantity comprises the amount of surface water in a particular area and is taken care of by the national government (main canals, lakes and rivers) and the regional water authorities (local bodies of water); water quality is also primarily managed by the government and regional water authorities and involves protecting surface water from pollution, in which the regional water authorities play a crucial role by treating wastewater.

In their designated territorial areas, the 21 regional water authorities are responsible for collecting and treating wastewater, among the other functions. To do so, they levy their own taxes and, consequently, have a democratically elected general assembly (Mostert, 2017). The assembly appoints the members of an executive committee that consists of a few governors that usually are responsible for one of the main functions of the authorities (i.e. flood control, water quantity and quality). The authorities thus are 'an autonomous, fully fledged authority alongside the State and provincial and local governments' (Havekes et al., 2015, p. 9) and play a crucial role in wastewater treatment under the supervision of the provinces and the national government.

Our case study of the reorientation towards a circular economy in the Dutch wastewater arrangement delves deeply into the function of wastewater treatment. As mentioned in the previous subsection, our research process started by interviewing wastewater experts at a university in a previous study. When asked who was shaping a circular economy in the Dutch wastewater sector, they typically mentioned the treatment managers and innovators of the regional water authorities. These actors belonged to the administration of several regional water authorities and were usually involved in the country-wide network and knowledge centre called the Energy & Resource Factory. This centre was founded in 2014 by the regional water authorities and plays a crucial role in promoting a transition towards resource recovery from wastewater. As we discuss in the next section (see "Empirical Analysis"), the establishment of the centre was preceded and followed by power struggles between established actors (e.g. the treatment governors, treatment managers and the research institute of the regional water authorities), and innovators who were usually employed by the regional water authorities and developed circular economy-activities in so-called sandboxes that allowed experimentation. Hence, our case focusses on the struggles between innovators, who were developing new activities, and established actors, who succeeded in restricting these activities by introducing incremental reforms. These struggles resulted in a shift from self-undermining towards self-reinforcing policy feedback, resulting in incremental instead of fundamental policy change.

## Empirical analysis

The idea of sustainability and, subsequently, a circular economy emerged in the Dutch wastewater sector around 2008. Therefore, in this fourth section, we first use the policy arrangement approach to describe the technology, actors, rules of the game, discourses and resources of the arrangement around the year 2008 (The Dutch wastewater policy arrangement around the year 2008). Next, we apply our power perspective. Specifically, 2014 marked a turning point as the Energy & Resource Factory was officially established and, as the analysis indicates, the power relations significantly changed. As a result, we divided our analysis of power struggles into two distinctive phases, one from 2008 to 2014 (Phase 1: power struggles between 2008 and 2014) and the second from 2014 to 2018 (Phase 2: power struggles between 2014 and 2018). By using the power perspective, we can analyse the role of power struggles in feedback processes, particularly by focussing on how these struggles support the original arrangement (i.e. self-reinforcing feedback) or undermine it (i.e. self-undermining feedback). Finally, we compare the original arrangement of around 2008 with the description of the arrangement in 2018 (The Dutch wastewater policy arrangement in 2018), which allows us to detect the change that has occurred or is ongoing in the arrangement.

### The Dutch wastewater policy arrangement around the year 2008

Using the policy arrangement approach, we describe the Dutch wastewater policy arrangement around the year 2008 along its five dimensions: technology, actors, rules, discourses and resources. First is the arrangement's technology. Over the nineteenth and twentieth centuries, a large-scale, centralised wastewater treatment infrastructure was developed in the Netherlands. In 2008, the country had approximately 350 treatment plants, 100.000 km of sewers and a sewer connection rate of 99%. The plants treated municipal wastewater, mixed with (treated) industrial wastewater and rainwater. After treatment, most of the sludge was incinerated and the effluent was discharged to surface water.

Second are the arrangement's established actors. The 27 regional water authorities (21 in 2018) were responsible for the three main functions of Dutch water management in their designated areas, namely the quality of surface water (i.e. wastewater treatment), flood control and the quantity of surface water. In every regional water authority, a treatment governor and a treatment manager were responsible for the daily business of their particular authority's wastewater management. To support their country-wide research institute, called the Foundation for Applied Water Research (in Dutch: Stichting Toegepast Onderzoek Waterbeheer, STOWA), the regional water authorities also pooled resources. As an umbrella organisation of the regional water authorities, the Association of Dutch Water Authorities (in Dutch: Unie van Waterschappen) also operated country-wide. This Association had several decision-making committees on which the regional water authorities were represented by a governor. Specifically, a treatment governor would represent the regional water authority in the Committee on Wastewater Treatment (in Dutch: Commissie voor Waterketens en Emissies, CWE), whereas the flood control and water quantity governors were part of the Association's committees on flood control and water quantity respectively. In turn, the wastewater treatment managers of the 27 regional water authorities frequently gathered in a well-organised, influential but informal network called the Association of Treatment Managers (in Dutch: Vereniging van Zuiveringsbeheerders, VvZB).

**Table 1** Dutch wastewater arrangement around 2008

| Arrangement's dimensions | Dutch wastewater arrangement around 2008 |
|---|---|
| Technology | Large-scale treatment infrastructure |
| Established actors | Regional: 27 regional water authorities, comprising treatment governors and treatment managers |
| | Country-wide: regional water authorities' research institute (STOWA) |
| | Country-wide: governors' Committee on Wastewater Treatment (CWE) within the Association of Dutch Water Authorities |
| | Country-wide: Association of Treatment Managers (VvZB) |
| Rules of the game | Autonomy of 27 regional water authorities |
| | Wastewater treatment silo, next to water quantity and flood control silos |
| | Cost efficiency |
| Discourse | 'Dry feet', sufficient water and clean water |
| Resources | Water taxes |
| | Techno-economic knowledge |

Remarkably, the flood control and water quantity managers of the regional water authorities do not have such an association.

Third, we review the rules of the game of the arrangement. In 2008, the 27 regional water authorities were autonomous, diverging authorities, leading to widely varying rules concerning organisational cultures, budgets, election results and priorities. Furthermore, in every regional authority, the three main functions and responsibilities were translated into organisational silos, each with a different budget, staff and knowledge. More broadly, the silos cut across the whole arrangement, shaping the organisational structure of the Association of Dutch Water Authorities (e.g. the different committees), STOWA's research lines and the collaboration of the treatment managers within their Association (VvZB). In addition, as wastewater management was in the public interest and taxes were levied, the regional water authorities were bound by strict budgets, leading to the powerful rule of cost efficiency in the arrangement. Concerning decision-making rules, the governors of every regional water authority were the governing officials and part of the CWE as such, whereas the treatment managers were their non-elected officials. Overall, concerning the rules of the game, Dutch water management's three main functions are interwoven with three organisational silos which, moreover, cut across 27 diverging regional water authorities.

Fourth, the dominant discourse within the regional water authorities was typically formulated as '"dry feet", sufficient water and clean water'. 'Dry feet' indicates the role of flood control, and sufficient water and clean water refer to the quantity and quality of water. Hence, the discourse is inextricably intertwined with the three main functions of Dutch water management and, accordingly, with the three organisational silos.

Fifth, in addition to the technology, actors, rules of the game and discourse, there are the resources of the arrangement. The regional water authorities employed 11,000 people, including those concentrated on wastewater treatment. Typically, this group provided considerable techno-economic knowledge and aimed to solve problems at the end of the pipe. Furthermore, regional water authorities' taxes generated 95% of their budget (€1.7 billion in 2000 and €2.8 billion in 2018). An increase in water taxes was generally perceived as unacceptable, which led to the decisive role of the cost efficiency rule in the arrangement.

This overview describes the five dimensions of the arrangement before the idea of sustainability started to develop (see Table 1 for a schematic summary). After analysing the two phases of power struggles (Phase 1: power struggles between 2008 and 2014 and Phase 2: power struggles between 2014 and 2018), we compare this original policy arrangement with the arrangement in 2018 to detect the changes in the arrangement over ten years (The Dutch wastewater policy arrangement in 2018).

## Phase 1: power struggles between 2008 and 2014

As mentioned, we use our power perspective to analyse how actors use power in policy feedback processes. In the first phase of struggles, both the established actors and the innovators derived power from three long-term trends, which facilitated self-undermining feedback dynamics. The innovators also developed innovative activities and an ambitious counter-discourse, seeking fundamental policy change and creating self-undermining feedback processes in the arrangement. Over time, the established actors reacted to this increasing pressure by using their strong position to guide the innovators, gradually generating self-reinforcing feedback processes.

### Three long-term trends in the Dutch wastewater policy arrangement

Three long-term trends have been pressing the arrangement since 2008, which, as the analysis will show, were used by both the innovative and established actors in their ongoing struggles, indicating the mobilisation of structural power. The first trend is the declining reputation of the regional water authorities. Historically, their raison d'être has been challenged because of the fragmented organisation, the 1953 floods and environmental and financial problems. Occasionally, the debate arises again, particularly on how to finance the extra layer of government. This case also occurred around 2010: the regional water authorities fulfilled their formal obligations and thus the results (i.e. flood control, sufficient water and clean water) of this work appeared as self-evident to Dutch citizens, who then questioned the purpose of water taxes.

Second are the (European) developments concerning climate change, circular economy and sustainable energy. These developments also took place in the Dutch water/wastewater sector: the regional water authorities signed the Dutch Long-Term Agreements on Energy Efficiency in 2008 and, until 2018, several other agreements on climate, sustainability, energy and resources were implemented.

The third trend is the European debt crisis that had been occurring. In the Dutch water sector, the Administrative Agreement on Water Affairs of the Ministry of Infrastructure and Water Management (2011) aims to reduce costs by €750 million by 2020, of which €240 million should be saved by the regional water authorities. To achieve these goals, the objectives are effective water management, increased efficiency and sector-wide collaborations. A higher societal cost or tax increase is not an option.

### Long-term trends, innovative activities and a counter-discourse undermine the arrangement

From 2008 onwards, the established actors exploited their dispositional power and derived structural power from the aforementioned trends, introducing the scope for acting

**Table 2** Main activities 2008–2014

| Year | Event(s) |
|---|---|
| 2008 | WaterWays, Energy Factory |
| 2010 | NEWater report (STOWA), cradle-to-cradle (CWE) |
| 2012 | Roadmap 2030, Resource Factory, TEDx talk |

differently. These dynamics also enabled the innovators to mobilise these trends (i.e. structural power) in several so-called sandboxes, which developed novel activities and a broad and ambitious counter-discourse that challenged the arrangement (i.e. relational power) (see Table 2 for activities 2008–2014).

The first new activity was implemented in 2008; the Association of Dutch Water Authorities' WaterWays was a sandbox that comprised 50 innovators who aimed to create a better reputation for the regional water authorities, which is a trend that is continuously used by established actors and innovators between 2008 and 2018 (see the previous subsection) . To accomplish this, WaterWays challenged the sector by using a prize question about innovative solutions. Four innovators and their regional water authorities proposed the concept of the Energy Factory to recover biogas from wastewater and, subsequently, 14 regional water authorities joined the association. Furthermore, the research institute (STOWA) published a 2030 vision report called NEWater on nutrient, energy and water recovery in 2010; interviews and multiple workshops were held for the Wastewater Management Roadmap 2030; the regional water authority in Apeldoorn started producing biogas; the governors' Committee on Wastewater Treatment (CWE) included cradle-to-cradle on their agenda; the Association of Dutch Water Authorities organised a phosphate working group; and innovators brainstormed the concept of the Resource Factory, which led to the TEDx talk on How to Turn Waste Water into a Goldmine and the first informal meetings between the regional water authorities and Aquaminerals (in brief, the Energy & Resource Factory of the drinking water companies).

As the sandboxes were usually affiliated with the policy arrangement, the innovators used their position in the arrangement (i.e. dispositional power) to increasingly use resources such as money, time and personnel to develop their innovative activities. For instance, the purpose of WaterWays was to influence the regional water authorities in a bottom-up manner and 'the young people in the Energy Factory were, in a way, detached from their water authority to play around, think freely and come up with the strangest things' (Interview 7). In the context of Roadmap 2030, an interviewee observes, 'In times of austerity […] it was exceptional how much space and time young, innovative engineers received to share [novel] ideas' (Interview 4). Three innovators of three regional water authorities also brainstormed for multiple days to develop their innovative ideas about the so-called Resource Factory.

Influenced by the innovators' sandboxes, a broad counter-discourse emerged that fundamentally challenged the policy arrangement. An interviewee observed 'a shift from climate adaptation or protection against the rising tide to climate mitigation' (Interview 14). This observation was also reflected by a range of problems identified in the reports NEWater and Roadmap 2030: resource scarcity (e.g. phosphorus and water), emerging pollutants, cost of wastewater treatment and dependence on fossil fuels, drought and floods, salinization and the decaying infrastructure. The reports also outlined a future vision and proposed the recovery of phosphorus, nitrogen and potassium (fertilisers); bioplastics; cellulose; algae; alginate; carbon dioxide; and sulphur and sulphate. As energy sources, the reports

detailed biogas (sludge and other biomasses), heat (thermal energy), hydropower (sewers), solar and wind energies. Additionally, by 2030, the separate pipes for storm water will be in use, rainwater will be harvested and effluent will be reused in industrial processes, cooling and artificial surface water and groundwater recharge. To achieve these ambitious objectives, a combination of large-scale infrastructure and new technologies such as decentralised treatment systems and constructed wetlands were considered. A strong focus was on collaborations between the regional water authorities and municipalities, drinking water companies and sectors such as agriculture, energy, food, chemistry and project development. Consequently, the sector's slogan changed to '"dry feet", sufficient water and clean water […] connected to a sustainable environment' (Chairperson Energy & Resource Factory, 2014). Hence, the innovators mainly used relational power to develop innovative activities, involving the introduction of a counter-discourse, new coalitions across the silos and organisational methods that fundamentally undermined the original arrangement.

### First reactions to the innovative activities reinforce the arrangement

Initially, the struggles of the innovators to act differently were partially supported by the established actors but, with time, the established actors increasingly used their strong position within the arrangement (i.e. dispositional power) to constrain these efforts, particularly by framing the sandboxes as inefficient. The treatment governors and managers started to raise questions on the cost efficiency of the sandboxes: 'Where is the taxpayer's money going? What are the results? What is the added value?' (Interview 13). Various interviewees also observe how the treatment managers attempted to influence the Energy Factory and the Roadmap 2030, which is summarised by an interviewee as follows: 'The establishment, the CWE and the managers kept on attempting to curb our sandboxes […] to control the whole process' (Interview 6).

Consequently, the CWE (treatment governors) and VvZB (treatment managers) attempted to make the innovators' sandboxes more efficient by institutionalising these boxes, particularly by establishing a new organisation called the Energy & Resource Factory (ERF) and then by embedding the innovators in the so-called 'ERF-core team'. By doing so, the established actors gained control over the innovators and their sandboxes: the ERF was officially established, its Transition Programme was published by all the regional water authorities, all the authorities financially contributed to the ERF (for the (limited) annual budget of approximately €550,000) and the hierarchical management structure of the ERF was established. This management structure is displayed in Fig. 2 and is mainly based on the flow of information between the different layers, although the managers and especially the governors have the last word. It thus shows how the established actors of the wastewater treatment silo (CWE and VvZB) are in charge. Moreover, established actors are represented in the steering group, which consists of a STOWA and Association of Dutch Water Authorities-representative, three treatment managers and the innovators of the ERF's core team. As such, the established actors locked the innovators' sandboxes in the established actor configurations and hierarchies, the silo of wastewater treatment and the focus on cost efficiency.

Summarising the first phase, the established actors and innovators interpreted and used the long-term trends, facilitating self-undermining feedback dynamics. This also allowed the innovators to develop new activities and a broad counter-discourse, leading to multiple options for radical change and strengthening the undermining processes. As this implied

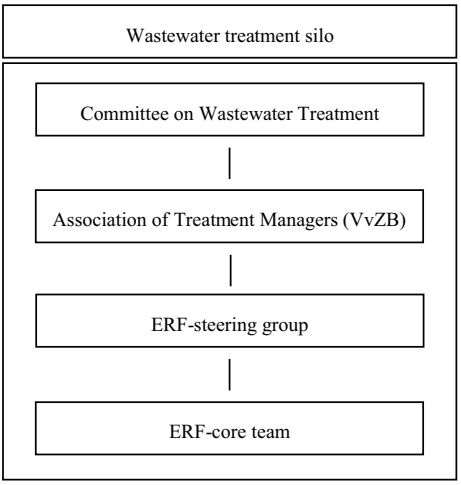


**Fig. 2** Management structure of the ERF in 2014

introducing new technologies, actors and rules that fundamentally challenged the arrangement, the established actors were increasingly pressured and cautious about these 'inefficient' activities. Therefore, they struggled to gain control over the innovators' sandboxes, gradually generating self-reinforcing processes. Overall, we observe the emergence of early, moderately strong self-undermining feedback, although the balance quickly started to shift towards self-reinforcing feedback dynamics that supported the original policy arrangement.

## Phase 2: power struggles between 2014 and 2018

As the established actors of the arrangement were confronted with challenging activities in the first phase, the start of the second phase is characterised by the official establishment of the ERF and a shift in power relations. Specifically, the established actors increasingly struggled to constrain the proposed fundamental changes by introducing incremental reforms, facilitating strong self-reinforcing feedback dynamics that steered the arrangement in the direction of its original position. Consequently, by 2018, the innovative activities and the broad counter-discourse were confined to the dimensions of the original arrangement.

### 'The sandboxes are dead' while the circular economy-trend gains in influence

From 2014 onwards, the innovators struggled to guarantee the survival of the sandboxes but their relational power to do so gradually diminished as the established actors had used their dispositional power to institutionalise the ERF. More precisely, no more space was available to act differently in the sandboxes: 'the group of freethinkers was more and more restricted by the managers and money, risk, legislation and business […], which may constrain innovation and novelty' (Interview 1). Additionally, another interviewee observes, 'the sandboxes are dead […] only six regional water authorities are still part of it and we have not met in the past 18 months' (Interview 15).

Nonetheless, the three long-term trends remained important (see the section "Three long-term trends in the Dutch wastewater policy arrangement"). For example, the bad

**Table 3** Main activities 2014–2018

| Year | Event(s) |
|---|---|
| 2014 | Establishment of the ERF, publication of the Transition Programme |
| 2015 | The ERF's problem of 'optimisation' |
| 2016 | Twynstra Gudde report: three limitations for optimising the ERF |
| 2017 | Top 5 of Resources report: five business cases and description of 'frontrunner groups' |
| 2018 | Start of the ERF 2.0-trajectory, including the frontrunner groups |

reputation of the regional water authorities remained an important trend, influencing the development of new activities, while the European debt crisis also pressurised the established actors to develop cost efficient solutions. The broader developments of climate change, circular economy and sustainable energy increased in relevance: in 2015, the European Commission published its Circular Economy Action Plan and, one year later, the Dutch government launched the programme A Circular Economy in the Netherlands by 2050, increasing the popularity of the circular economy. As we will discuss, the established actors in particular mobilised these trends as a source of structural power to develop a watered-down circular economy-discourse.

### Efficiency and a watered-down circular economy-discourse reinforce the arrangement

The pressure arising from the innovators in the first phase led the established actors to use power to steer the new activities and broad counter-discourse of the innovators in the direction of the existing large-scale technology, established coalitions, dominant rules and discourses (see Table 3 for activities 2014–2018). More precisely, the CWE (treatment governors) used its position to raise questions on the (cost) efficiency of the innovators' sandboxes: 'Can you develop a realistic business case? […] How do you create a domestic market for struvite? And what is the timeline?' (2013, p. 2). The Transition Programme of the newly institutionalised ERF also stated: 'the sandboxes are not open-ended' (ERF, 2014, p. 27). Furthermore, off-the-record, the ERF was frequently conceptualised as a 'talking shop'. The established actors thus used their strong position within the arrangement to frame the sandboxes and the ERF as neither effective nor cost efficient, indicating the use of dispositional power.

According to these established actors, the ERF had to manage its so-called problem of 'optimisation'. Specifically, the CWE requested the VvZB (treatment managers) to solve this problem: the ERF and Aquaminerals employed a business developer in 2016 and a consultancy company (Twynstra Gudde) conducted a study on the Organisational Options for the Optimisation of the ERF. The study discussed three limitations for optimising the ERF: the limited knowledge of business development, the low financial capacity and the absence of a shared vision on the governance of the ERF. Thus, the CWE asked the VvZB and STOWA to explore opportunities for business development. A report called the Top 5 of Resources was provided in 2017 by another consultancy company, which discussed the business cases of five resources (phosphorus, cellulose, bioplastics, alginate-like polymers and biomass)[1] and described the (five 'frontrunner groups' of) regional water authorities

[1] Energy recovery is not discussed 'because a lot of regional water authorities are already working on that topic' (ERF, 2017, p. 5).

that wanted to collaborate on a particular resource. The CWE and VvZB generally agreed with this proposal, which marked the start of the ERF 2.0-trajectory.

Following the Top 5 of Resources report, the ERF 2.0-trajectory implied that frontrunner groups were established in the ERF, and each group comprised at least one treatment manager (from the VvZB) and the business developer of the ERF or a staff member of Aquaminerals. In line with the Twynstra Gudde study, this indicated that the problem concerning business case development was considered solved because Aquaminerals and the ERF's new business developer provided new knowledge. The governance problem was also perceived as solved because a manager could now enter contracts with firms. The limited financial capacity of the country-wide ERF was more challenging for the autonomous, regional water authorities and was postponed until 2019.

In addition to using dispositional power in the ERF 2.0.-trajectory, the established actors also derived structural power from the circular economy-trend to shape a specific, watered-down discourse on the circular economy, which then replaced the innovators' broad counter-discourse. Elements of this new discourse can be found in, for instance, the ERF's Top 5 of Resources report subtitle, which is 'From Supply to Demand' and, correspondingly, the slogan is 'From a Technology Push towards a Market Pull', both indicating the necessity of business case development and cost efficiency. In this context, an interviewee also says: 'regarding energy recovery, the driver is money because less sludge implies less dewatering, transport and energy, and more money […] and, similarly, I think that resource recovery is framed as green as well' (Interview 9). Furthermore, biogas and the Top 5 of Resources can be recovered by optimising the established, centralised, large-scale infrastructure. As the new circular economy-discourse revolves around cost efficiency and the large infrastructure and is said to complement the older discourse of 'dry feet', sufficient water and clean water, it is largely in line with the original policy arrangement, indicating incremental changes.

Summarising the second phase, in reacting to the challenging activities and pressures of the innovators, the established actors increasingly struggled to strengthen the original policy arrangement, which facilitated self-reinforcing feedback dynamics. They acquired this by mobilising the three trends and by using their strong position, particularly to support the original arrangement with incremental reforms: optimising the large-scale technology to recover the Top 5 of Resources, retaining cost efficiency by developing business cases, creating a watered-down discourse that complements the older discourse and limiting the financial capacity of the Energy & Resource Factory. Thus, the innovators' attempts to fundamentally change the arrangement were replaced by incremental reforms, indicating a shift from self-undermining dynamics in the first phase, towards strong self-reinforcing feedback dynamics in the second phase.

## The Dutch wastewater policy arrangement in 2018

In the previous sections, we showed how the original Dutch wastewater policy arrangement of around the year 2008 influenced the power struggles of actors, which then first generated self-undermining dynamics in the first phase and, subsequently, self-reinforcing processes in the second phase. Therefore, we can also detect the changes that have occurred in the arrangement by comparing the technology, actors, rules, discourses and resources of the original arrangement with the same dimensions in 2018.

The large-scale treatment infrastructure remains in place and the Top 5 Resources selected can be recovered by optimising this technology. This is being gradually realised

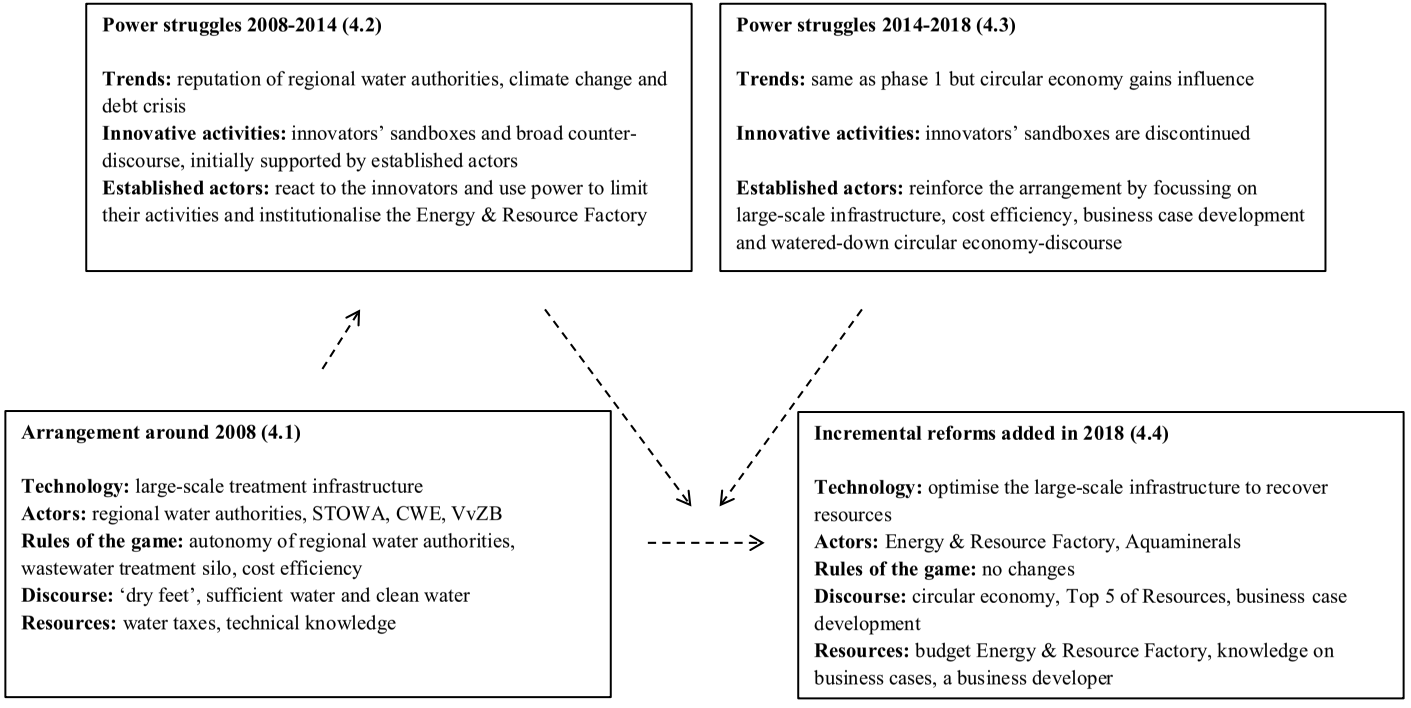


**Fig. 3** Schematic summary of the empirical analysis

as approximately 20 out of 314 plants are experimenting with the recovery of cellulose and phosphorus. Although the Energy & Resource Factory (and Aquaminerals) is a new actor, the established actors such as the regional water authorities, their research institute (STOWA), Committee on Wastewater Treatment (CWE) and the Association of Treatment Managers (VvZB) clearly retain a dominant role. Similarly, the rules of the game have not changed: the autonomy of the 21 regional water authorities continues to be important, the silos are still intact and the rule of cost efficiency prevails. As discussed, the new, watered-down circular economy-discourse is said to complement the dominant discourse on 'dry feet', sufficient water and clean water. In line with the other dimensions, the resources have remained stable but the budget of the Energy & Resource Factory, knowledge on business development and the employment of the business developer indicate small changes. The general finding is that the arrangement has changed only incrementally.

Figure 3 summarises the empirical analysis. It displays the five dimensions of the original policy arrangement of around 2008 (see the section: "The Dutch wastewater policy arrangement around the year 2008") and, along these five dimensions, the incremental reforms added to the arrangement by 2018 (see the section: "The Dutch wastewater policy arrangement in 2018"). Instead of fundamental policy change, incremental reforms resulted from the power struggles between 2008 and 2014 (see the section: "Phase 1: power struggles between 2008–2014"), facilitating moderately strong self-undermining feedback that quickly shifted to self-reinforcing feedback dynamics, as well as from the power struggles between 2014 and 2018 (see the section: "Phase 2: power struggles between 2014–2018"), generating even more self-reinforcing feedback that steered the arrangement in the direction of its original position. In the discussion, we explore these observations, further focussing on the power struggles of actors in policy feedback processes.

## Discussion

The "Empirical analysis" describes how the Dutch wastewater policy arrangement influenced the power struggles of actors from 2008 onwards and how the original arrangement then changed only incrementally by 2018. By using the specificities of this empirical analysis, in this section, we explore the research questions about how actors use power in policy feedback processes, resulting in incremental instead of fundamental policy change. Four steps are taken: (1) we interpret the results using Weaver's (2010) patterns of policy regime change and also discuss powerful actors and the availability of incremental reforms; (2) we subsequently argue that feedback processes are not a given but require ongoing struggles of political actors; (3) we turn to the interpretation and use of (long-term) feedback processes; and, (4) finally, we provide lessons for practitioners.

First, we showed that the balance between self-undermining and self-reinforcing feedbacks quickly shifted towards self-reinforcing dynamics, resulting in incremental instead of fundamental policy change. In the first phase of struggles, the long-term trends and innovative activities led to multiple options for fundamental policy change. However, as soon as the political pressure increased, this self-undermining feedback was immediately balanced with early, moderately strong self-reinforcing feedback. From this moment onwards, this self-reinforcing feedback only increased, steering the arrangement in the direction of its original position in the second phase. From Weaver's (2010) perspective on patterns of policy regime change, the first phase resembles the 'paths and forks' pattern because alternative policy opportunities emerged but these were largely determined by and developed

within the original arrangement. Focussing on the second phase shows that the self-reinforcing effects were clearly delayed and initially permitted some choices for fundamental change (i.e. forks in the path) in the first phase but then, in the second phase, quickly forced a reversal in the direction of the original arrangement, corresponding to the 'boomerang pattern'. Although self-undermining feedback may emerge again over time, Weaver suggests that the occurrence of policy change is also dependent on powerful actors that may block alternative options as well as on the availability of reforms to incrementally change the original arrangement, which we discuss in sequence.

Concerning powerful actors, the analysis illustrates that the power of the established actors was crucial in the boomerang pattern and in maintaining the original policy arrangement, particularly because the balance quickly shifted back towards self-reinforcing feedback dynamics. Specifically, although the established actors partly facilitated the first phase's self-undermining dynamics, they also used (dispositional) power as soon as these dynamics led to fundamental challenges for the established technology, hierarchies and rules. Not surprisingly, the established actors increasingly used power in the second phase to support the arrangement's infrastructure, discourses and resources, facilitating strong self-reinforcing feedback dynamics. Regarding the availability of incremental reforms, the analysis indicates that the availability of these reforms was influential in the shift from the paths and forks towards the boomerang pattern. Among the incremental reforms are: the regional water authorities' Top 5 of Resources report that only describes resources that can be recovered in the existing, large-scale wastewater treatment plants; the institutionalisation of the Energy & Resource Factory which means that the established coalitions took control over the innovators; along the lines of the rule of cost efficiency, the increased focus on business case development; the construction of a watered-down circular economy-discourse that complements the dominant discourse; and the limited amounts of financial resources that are transferred to the country-wide Energy & Resource Factory by the 21 autonomous, regional water authorities. Hence, from the end of the first phase onwards, the balance shifted towards self-reinforcing dynamics through a range of incremental adjustments to the original policy arrangement, helping to manage the self-undermining dynamics that resulted from the proposals for fundamental policy change in the first phase. Our findings thus confirm that self-undermining feedback dynamics do not automatically lead to change (Béland & Schlager, 2019; Jacobs & Weaver, 2015; Weaver, 2010), particularly when powerful actors impede fundamental changes in a policy arrangement and when these actors have incremental reforms at hand, both requiring more attention in policy feedback research.

Second, based on our findings regarding powerful actors and the availability of incremental reforms in feedback processes, the results also emphasise that self-reinforcing feedback is not a given but requires ongoing struggles from powerful actors. For instance, as soon as the self-undermining dynamics fundamentally challenged the policy arrangement's technology, hierarchies and rules, the established actors started struggling to constrain the innovative activities to the dimensions of the arrangement. Consequently, from the end of the first phase onwards, they intentionally reinforced the original policy arrangement by supporting it with incremental reforms. This highlights that the ongoing struggles of powerful actors are important in supporting self-reinforcing feedback dynamics, particularly they continuously made political choices that sustained established policies. This finding supports recent recommendations to address the actors and agency in policy feedback research (Béland et al., 2019; Sewerin et al., 2020) and the totalising descriptions of path-dependency and lock-in (Buschmann & Oels, 2019; Garud et al., 2010; Klitkou et al., 2015).

Third, although the empirical analysis emphasises incremental reforms and the continuous efforts of powerful actors in facilitating self-reinforcing feedback dynamics to maintain the original arrangement, it also shows that innovative actors may interpret policy consequences to use feedback as a resource to propose fundamental policy change, supporting self-undermining feedback. This becomes particularly clear in the first phase of power struggles, in which the interpretations of the three long-term trends by the established actors and innovators facilitated policy undermining dynamics. The activities of the innovators are of particular interest here: they first derived structural power from the three long-term trends and then used relational power to act differently by introducing alternative technologies, coalitions and discourses, undermining the arrangement. Here our analysis indicates that the manners in which policy consequences are constructed as self-undermining feedback require more attention (Dagan & Teles, 2015; Moore & Jordan, 2020). It also makes so-called exogenous factors (i.e. long-term trends) more endogenous, particularly by demonstrating that actors draw on long-term feedback loops such as sustainability trends or macroeconomic processes (Schmid et al., 2019). However, as mentioned, these change-inducing power struggles were quickly constrained by the established actors from the end of the first phase onwards, suggesting that when the interpretations of policy consequences are not anchored in shared understandings and institutions, innovators face powerful actors, rules and discourses (Dagan & Teles, 2015; Jacobs & Weaver, 2015). Generally, our findings also confirm that the power framework and policy arrangement approach we applied are useful tools for understanding the power struggles of actors in policy feedback processes.

Finally, for practitioners involved in enabling a circular economy, the analysis emphasises the importance of power struggles in circular economy-processes, which are often neglected in a field dominated by technological and economic knowledge (Bauwens et al., 2020; Calisto Friant et al., 2020; Hobson, 2020). Specifically, it illustrates that the innovators' struggles to introduce a circular economy faced resistance from established actors. Thus, these actors supported the established technology, rules and discourses with incremental changes, resulting in a largely stable policy instead of a fundamental shift towards circularity (further confirmed by Fitch-Roy et al. (2019) and Simoens and Leipold (2021), among others). Hence, we presented a different way of understanding the potential beginnings of a circular economy (Zwiers et al., 2020), which may be used by practitioners in learning processes on a circular economy.

## Conclusion and future research

As environmental problems are usually not tackled with path-departing green policies but rather with incremental adjustments, this study attempted to explore incremental change by analysing the power struggles of actors in policy feedback processes. To do so, we applied an established power perspective and the policy arrangement approach to a case study of the reorientation towards a circular economy in the Dutch wastewater policy arrangement between 2008 and 2018, which led to incremental instead of fundamental policy change. The results showed that self-undermining feedback was generated from 2008 onwards but that the balance almost immediately shifted back to self-reinforcing feedback. This resembles a shift from the paths and forks towards the boomerang pattern of policy change, indicating that the power struggles of the actors involved led to incremental reforms in the arrangement. The study clarified these patterns by concentrating on powerful actors that

may impede change through the use of incremental reforms, the ongoing struggles of these actors in facilitating self-reinforcing feedback and the interpretation of the consequences of policies to use feedback as a resource. Taken together, the study's analysis of the power struggles of actors in policy feedback processes contributes to a more nuanced understanding of incremental change. Thus, we paved the path for investigating broader questions regarding 'the agency of actors, existing policy legacies and, institutional change' (Béland, 2010, p. 583) in policy feedback processes. We also provided a different way of knowing the potential beginnings of a circular economy by emphasising power struggles.

There are at least three promising avenues for future research. First, as we draw lessons from a single-case study, future research could 'transfer' our findings to other settings (Schwartz-Shea, 2006) by, for instance, investigating power struggles in policy feedback processes related to a specific policy instrument or policy mix instead of a policy arrangement or regime, by focussing on interpretive or resource feedback effects, by analysing other sectors or policy fields, by applying different analytical frameworks, and by further exploring how, why, when and to what extent shifts from self-undermining (e.g. proposals for fundamental change) to self-reinforcing feedback (e.g. incremental reforms) occur in environmental politics. Second, we added technology to the dimensions of a policy arrangement but did not systematically analyse the materiality of technology throughout the study. It may be worthwhile to focus exclusively on technology in policy (feedback) processes, particularly by involving other research fields (e.g. Geels, 2020; Kotilainen et al., 2019; Schmidt & Sewerin, 2017). Finally, further delving into the agency of established actors is particularly important; in investigating the what, how and why of the power struggles in our analysis, why certain actors acted in specific manners was specifically intriguing and fruitful for understanding the case.

## Appendix

### Analysed interviews

| # | Organisation | Date |
|---|---|---|
| 1 | Regional water authority & ERF | 15/12/2017 |
| 2 | Regional water authority | 6/2/2018 |
| 3 | STOWA | 26/2/2018 |
| 4 | Consultancy company | 27/2/2018 |
| 5 | Aquaminerals | 28/2/2018 |
| 6 | Regional water authority | 21/3/2018 |
| 7 | Dutch water authorities, CWE & ERF | 26/3/2018 |
| 8 | Regional water authority & CWE | 3/4/2018 |
| 9 | Delft University of Technology | 12/4/2018 |
| 10 | Aquaminerals & ERF | 19/4/2018 |
| 11 | Delft University of Technology | 23/8/2018 |
| 12 | Rioned | 22/10/2018 |
| 13 | Regional water authority, ERF & VvZB | 1/11/2018 |
| 14 | Regional water authority | 23/11/2018 |
| 15 | Regional water authority & ERF | 3/12/2018 |

## Earlier interviews (on a circular economy in the Dutch wastewater system)

| # | Organisation | Date |
|---|---|---|
| A | Delft University of Technology | 19/1/2017 |
| B | Natuurpunt | 16/3/2017 |
| C | Ghent University | 17/3/2017 |
| D | STOWA | 23/3/2017 |
| E | Delft University of Technology | 29/3/2017 |
| F | Ghent University | 3/4/2017 |
| G | Dutch Water Authorities | 4/4/2017 |
| H | Regional water authority & ERF | 10/5/2017 |
| I | DeSaH (engineering firm) | 30/10/2017 |
| J | Delft University of Technology | 9/11/2017 |
| K | Evides (drinking water company) | 27/11/2017 |
| L | Delft University of Technology | 5/12/2017 |

## Analysed (participatory) observations

| # | Topic of the meeting | Date |
|---|---|---|
| 1 | 70th 'holiday workshop' of the Dutch water sector | 12/1/2018 |
| 2 | ERF core team | 12/2/2018 |
| 3 | ERF core team | 13/3/2018 |
| 4 | ERF and CWE: ERF 2.0 | 14/4/2018 |
| 5 | ERF working groups + core team | 18/4/2018 |
| 6 | ERF core team | 18/4/2018 |
| 7 | ERF working groups + core team | 28/6/2018 |
| 8 | ERF-steering group | 11/7/2018 |

## Earlier observations (related to the circular economy in the Dutch wastewater system)

| # | Topic of the meeting | Date |
|---|---|---|
| 1 | Presentation Jules van Lier & Mark van Loosdrecht (kick-off SuPER-W network) (Delft) | 11/2016 |
| 2 | STOWA Platformdag Nieuwe Santatie [Network event New Sanitation] | 4/2017 |
| 3 | SuPER-W network meeting (Aachen) | 6/2017 |
| 4 | STOWA: platformdag Nieuwe Santatie [Network event New Sanitation] | 9/2017 |
| 5 | STOWA: stedelijk water: brandstof voor de circulaire economie [municipal water: driver for a circular economy] | 10/2017 |
| 6 | SuPER-W network meeting (Delft) | 1/2018 |

## Analysed documents

### Field (internal documents)

- 20180212—KT1—Actielijst Programmateam bijgewerkt per31 jan
- 20180212—KT1—agenda Programmateam 21 februari 2018
- 20180212—KT1—CONCEPT verslag Programma team 31–1–2018—ver
- 20180212—KT1—EFGF field notes core team
- 20180313—KT2—Actielijst Programmateam bijgewerkt per21 feb
- 20180313—KT2—agenda Programmateam 14 maart 2018
- 20180313—KT2—agendapunt 6—Werkgroep ***—PT 14–3
- 20180313—KT2—concept verslag Programma team 21–2
- 20180313—KT2—field notes core team
- 20180313—KT2—Stavaza doelen EFGF 1e kwartaal 2018 -
- 20180322—SG1—04—Begroting 2017 EFGF—agendapunt 4—SG
- 20180322—SG1—06- 20180319_Voorstel ***_verankering
- 20180322—SG1—ACTIELIJST stuurgroep EFGF bijgewerkt per 6 de
- 20180322—SG1—Agenda Stuurgroep 22 maart 2018
- 20180322—SG1—CONCEPT—verslag stuurgroep 6 december 2017
- 20180322—SG1—Discussienotitie *** Versie 12 februari 2018
- 20180322—SG1—MEMO resultaat EFGF 2017—agendapunt 4—SG 2
- 20180322—SG1—Voorgang programmadoelen EFGF 1e kwartaal 2018
- 20180403—KT3—Actielijst Programmateam bijgewerkt per 14 m
- 20180403—KT3—Actielijst Programmateam bijgewerkt per 5 apr
- 20180403—KT3—agenda Programmateam 5 april 2018
- 20180403—KT3—CONCEPT verslag Programma team 14–3-2018
- 20180403—KT3—CONCEPT verslag Programma team 5–4-2018
- 20180414—CWE-EFGF—Agenda bijeenkomst CWE 13 april
- 20180414—CWE-EFGF—field notes ERF 2.0
- 20180418—BKT1—19 December 2017—Verslag Breed Kernteam EFG
- 20180418—BKT1—ACTIELIJST BREED kernteam EFGF—2017
- 20180418—BKT1—ACTIELIJST BREED kernteam EFGF—2018
- 20180418—BKT1—Agenda Breed Programmateam 19 April 2018
- 20180418—BKT1—breed programmateam EFGF—STOWA
- 20180418—BKT1—CONCEPT Agenda Breed Programmateam 19 april
- 20180418—BKT1—CONCEPT verslag Programma team 5–4-2018
- 20180418—BKT1—Field Notes working groups and core team
- 20180418—KT4—Actielijst Programmateam bijgewerkt per 5 apr
- 20180418—KT4—agenda Programmateam 19 April 2018
- 20180418—KT4—CONCEPT verslag Programma team 5–4-2018
- 20180418—KT4—Field notes core team
- 20180516—KT5—Actielijst Programmateam bijgewerkt per 19 ap
- 20180516—KT5—agenda Programmateam 16 mei 2018
- 20180516—KT5—Communicatieplan EFGF 2018–2019
- 20180516—KT5—CONCEPT verslag Programma team 19–4-2018
- 20180516—KT5—Kwartaaldoelen EFGF 2e kwartaal 2018
- 20180628—BKT2—ACTIELIJST BREED kernteam EFGF—2018
- 20180628—BKT2—ACTIELIJST BREED kernteam EFGF—2018

- 20180628—BKT2—Agenda Breed Programmateam 28 juni 2018
- 20180628—BKT2—CONCEPT verslag Programma team 28 juni 2018
- 20180628—BKT2—field notes working groups + core team
- 20180628—BKT2—Memo *** en *** enveloppe -
- 20180628—BKT2—Memo voortgang ***—tbv SG 11-
- 20180711—SG2—01—Agenda Stuurgroep 11 juli 2018
- 20180711—SG2—02 -ACTIELIJST stuurgroep EFGF bijgewerkt per
- 20180711—SG2—02—CONCEPT—verslag stuurgroep 23 maart 2018
- 20180711—SG2—03—memo SK—Kwartaaldoelen EFGF 2e kwartaal
- 20180711—SG2—03 -Kwartaaldoelen EFGF 3e kwartaal 2018
- 20180711—SG2—04—***—status stuurgroep 7 juli
- 20180711—SG2—06—A—ANNOTATIE behorend bij agendapunt 5
- 20180711—SG2—06—C—notulen biomassa kopgroep 30 m
- 20180711—SG2—06- D– notulen biomassa kopgroep 25–05-
- 20180711—SG2—08—2018–07-05_Jaarrekening 2017 van de EFGF
- 20180711—SG2—09—van 2018–07-04__Begroting 2018 versie 2.2
- 20180711—SG2—B—Opdracht voor verkenning
- 20180711—SG2—field notes steering group

**CWE (internal documents for all years before 2018)**

- CWE 10-13- 05-02-2010
- CWE 10-33a- 28-05-2010
- CWE 10-44a- 15-10-2010
- CWE 11-1- 10-12-2010
- CWE 11-21a- 04-02-2011
- CWE 12-1a- 18-11-2011
- CWE 12-26a- 17-02-2012
- CWE 12-55- 08-06-2012
- CWE 13-21- 15-02-2013
- CWE 13-37a- 07-06-2013
- CWE 14-41a- 09-05-2014
- CWE 15-1- 21-11-2014
- CWE 15-29a- 29-05-2015
- CWE 16-20- 12-02-2016
- CWE 16-42- 03-06-2016
- CWE 17-1- 02-12-2016
- CWE 17-16- 17-02-2017
- CWE 17-36a- 19-05-2017
- CWE 18-1a- 01-12-2017
- CWE 18-44- 18-05-2018
- CWE 18-69a-14/11/2018-EFGF2.0
- CWE 18-69b—Een slagvaardig netwerk
- CWE 18-70a
- CWE 18-70b
- CWE 18-70c
- Verslag CWE 30/11/2018

### Other

- CWE—2017—oplegnotitie (internal)
- CWE—2017—oplegnotitie top 5 grondstoffen (internal)
- CWE—2018—Unie—EFGF (internal)
- CWE—2018—Unie—EFGF—bijlage (samengevat) (internal)
- De Korte – 2018—Ondraaglijke stank en ander ongerief
- EFGF—2010—Energy Factory
- EFGF—2012—TedX EFGF
- EFGF—2014—Terugwinnen wat van waarde is (speech)
- EFGF—2014—Transitieprogramma 2014–2018
- EFGF—2014—Twynstra Gudde notitie
- EFGF—2016—Twynstra Gudde—Organisatorische opties (internal)
- EFGF—2017—top 5
- EFGF -2017—doorontwikkeling—concept visiedocument (internal)
- EFGF—2018—EFGF 2.0.—via versie 16–3 voor SG (internal)
- EFGF—2018—EFGF 2.0.—versie 6–4—DEF. versie voor CWE (internal)
- EFGF—2018—hoe is efgf ontstaan
- EFGF—ND—top 5 trekkers
- Havekes et al.—2015—The Dutch water authority model
- Lazaroms Poos—2004—The Dutch water board model
- Rioned—2013—strategienota
- Slideshow online AA en Maas—relatie Berenschot en Twynstra
- Spaan Menno—2018—innovatie en EFGF
- STOWA—2008—Frijns—Roorda—Mulder
- STOWA—2010—NEWater
- STOWA—2015—2015-2schw017
- Unie & VNG—2012—Routekaart 2030
- Van den Oever—2018—PhD thesis
- Van veldhuizen—2013—water governance EFGF
- WarerWegen—2010—Factsheet
- WaterWegen—2012—LEF document
- 2011—Bestuursakkoord water

### Observed newsletters

- https://www.aquafarm.nl/
- https://www.efgf.nl/
- https://www.eureau.org/
- https://www.h2owaternetwerk.nl
- https://www.kwrwater.nl/
- https://www.uvw.nl/
- https://www.samenwerkenaanwater.nl/
- https://www.stowa.nl/
- https://www.thesourcemagazine.org/
- https://www.waterforum.net/
- http://wsstp.eu/

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**Declarations**

**Conflict of interest** The authors declare that they have no conflict of interest.



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