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Wastewater management by citizens: mismatch between legal rules and self-organisation in Oosterwold

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Self-organisation in environmental service delivery is increasingly being promoted as an alternative to centralised service delivery. This article argues that self-organised environmental service delivery must be understood in the context of legal rules, especially environmental legislation. The article's aim is twofold: first, to understand the changing relationship between the government and citizens in self-organised service delivery, and second, to explore how self-organised environmental service delivery complies with environmental quality requirements stipulated in legislation. The empirical study focuses on wastewater management in Oosterwold, the largest Dutch urban development that experimented with self-organisation. The results show that while individual wastewater management was prioritised and implemented at scale, the applicable legal rules were not adequately considered and integrated. Consequently, the experiment led to a deterioration of water quality. The article concludes that the success or failure of self-organisation in delivering environmental services such as wastewater management critically hinges on ensuring compliance with environmental legislation.

Keywords: self-organisation; wastewater management; urban development; experiment; institutions; legal rules

1. Introduction

How does self-organised wastewater management in urban development interact with the normative quality characteristics of legal rules? Since the turn of the twenty-first century, the delivery of environmental services by citizens in urban development has been gaining momentum, expressed by policy aspirations such as self-organised energy management (e.g. Van Aalderen and Horlings 2020) and green self-governance (e.g. Mattijssen *et al.* 2018). The increasing role of citizens in environmental services delivery fits within the broader context of the growing importance of self-organisation for urban development (Boonstra and Boelens 2011; Nederhand, Bekkers, and Voorberg 2016; Savini 2016a, 2016b; Nederhand and Van Meerkerk 2018; Moroni, Rauws, and Cozzolino 2020). There is a widespread belief that self-organisation can be a potential solution to the “decreased legitimacy” of the government (Nederhand and Van Meerkerk 2018, 533), strengthens localism and liberal individualism (Davoudi and

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Madanipour 2015; Savini 2016a, 2016b), features better responsiveness to changing citizen needs and preferences (Gofen 2015), and addresses the pitfalls of neoliberal service delivery that “dehumanised” society (Verhoeven and Tonkens 2013, 416). The academic literature broadly defines self-organisation along two streams: first, as the spontaneous emergence of (spatial) order without government guidance and control (Boonstra and Boelens 2011; Moroni 2015; Partanen 2015; Rauws 2016; Savini 2016a, 2016b), and second, as the idea that citizens are the actors who can organise the delivery of public services in the most effective way (Gofen 2015; Verhoeven and Tonkens 2013; Nederhand, Bekkers, and Voorberg 2016; Nederhand and Van Meerkerk 2018). It is this latter definition that arouses the interest of this article.

For many Western welfare states, the belief in self-organisation implies an explicit shift from traditional environmental service delivery by the government to “active citizenship” (Verhoeven and Tonkens 2013). Increasingly, governments want citizens to organise the delivery of environmental services that would usually fall under government control. This shift redefines the relationship between the government and its citizens. Gofen (2015) talks of a shift from the citizen as “consumer” to the citizens as “entrepreneur”. While scholars often acknowledge this changing relationship (e.g. Gofen 2015; Savini 2016a, 2016b; Nederhand and Van Meerkerk 2018; Moroni, Rauws, and Cozzolino 2020), less attention has been paid to whether the consequences of this renewed relationship in environmental service delivery satisfies relevant environmental legislation. In many welfare states, there is a long tradition of environmental legislation that provides legal certainty in the protection of the environment and human health (Van Rijswick and Salet 2012; Dembski 2020). Generally, governments have devised (and in the context of sustainability are still devising) many legal rules to enable, secure and improve the delivery of environmental services. These legal rules are established through time, gradually reformed under changing circumstances, recognised over many different situations and rooted in broad social networks (Salet 2018). Traditional environmental service delivery by the government is often backed up by the environmental legislation that protects human health and the environment.

While some scholars have highlighted the importance of legal rules for self-organisation (e.g. studies on legal contextualisation¹ from Van Rijswick and Salet 2012; Salet and De Vries 2019; Dembski 2020), others have emphasised the challenges that legal rules pose for self-organisation (Davoudi and Madanipour 2015; Rauws and de Roo 2016). Despite various academic attempts to consider legal rules and self-organisation, it is unclear how relevant legal rules (environmental legislation in particular) condition people’s performance through self-organisation (Dembski 2020). The main argument here is that it is vital to explore the real-life mechanisms of self-organised environmental service delivery in urban development and to link these practices to the legal rules of environmental legislation. Therefore, the central aim of this article is twofold: first, to understand the changing relationship between government and citizens in self-organised environmental service delivery, and second, to explore how self-organised environmental service delivery interacts with existing environmental legislation. The central question is formulated as follows: *How does self-organised delivery of environmental services in urban development interact with relevant environmental legislation?* This article defines environmental legislation as a dynamic set of rules defined by law, which (often in the form of environmental and health standards) provide legal certainty and oblige public control of service quality. In other words, these legal rules condition human behaviour to achieve public benefits and utility in environmental matters (Moroni 2015; Savini 2016a, 2016b).

These legal rules are established at different scale levels, from local to national and European (Savini 2016a, 2016b).

The substantive focus of this article is on wastewater management for two main reasons. First, the topic of wastewater is fascinating because of the strong focus on promoting centralised service delivery, ever since the Industrial Revolution. To illustrate, wastewater management in France is partly privatised but actively under public control (Richard, Bouleau, and Barone 2010); Germany's wastewater management is undertaken by the government (Wolf and Störmer 2010), while in the Netherlands, wastewater management constitutes a governmental hierarchy restricting any form of privatisation (Van der Hoek, de Fooij, and Struker 2016). Second, the literature on self-organised environmental service often does not include examples of direct wastewater management by citizens. Nevertheless, due to the growing popularity of localism and individualism (Davoudi and Madanipour 2015), new arrangements for wastewater management are being considered, supported by social and technological experiments in wastewater management beyond centralised service delivery (Eggimann, Truffer, and Maurer 2015; LaGro, Vowels, and Vondra 2017). Therefore, exploring self-organised wastewater management provides a valuable contribution to the understanding of self-organisation of environmental services.

The article is structured as follows. First, the changing relationship between citizens and the government in self-organised service delivery is sketched. After that, the historical and legal context of wastewater management in the Netherlands is described. Empirically, this study focuses on the service delivery of wastewater management in Oosterwold (Almere, the Netherlands), the largest urban development in the Netherlands that experimented with self-organisation. The article then analyses the implications of self-organised wastewater management in Oosterwold in the context of environmental legalisation. It ends with a concluding note that, for legal certainty concerns, it is important to consider environmental legislation seriously in self-organisation.

2. Self-organised public service delivery

Public service delivery refers to the mechanism through which public services are delivered to citizens. Usually, these services should be in the public interest and available to all (Gofen 2015). In the aftermath of the Second World War, most advanced welfare states centralised public service delivery *via* collective arrangements aiming for widely accessible and high-quality public services. The underlying rationale of the welfare state is that the government is in the best position to provide public services and general welfare that benefits its citizens. Rather explicitly, this rationale assumes that individuals are passive recipients (Gofen 2015), who cannot organise themselves to deliver public services. However, the delivery of public services by the government has not been without its setbacks (Nederhand, Bekkers, and Voorberg 2016). Two of the most well-known critiques are the government's inability to adequately capture citizens needs and preferences (Gofen 2015) and inefficiency and ineffectiveness in public service delivery (Nederhand *et al.* 2019). As a result, alternative arrangements of public service delivery emerged, ranging from market approaches based on "new public management" conceptions (Bryson, Crosby, and Bloomberg 2014; Salet and de Vries 2019) to government-citizen arrangements based on the belief in the benefits of co-production (Brandsen and Pestoff 2006; Loeffler and Bovaird 2016). In recent

years, the self-organisation of public service delivery by citizens seems to move to the forefront of this debate.

The argument that citizens can self-organise to deliver public services is not new. One of the most famous advocates of self-organisation is the economist Elinor Ostrom; in her celebrated book *Governing the Commons*, she argued that communities could successfully organise themselves while reaching further than their individual interests (Ostrom 1990). She acknowledged that centralised service delivery might be inevitable in some instances, yet effectiveness will remain a challenge because it lacks information on local needs and conditions. In her work, Ostrom preferred to focus on public goods that are economically defined as “common-pool resources”, such as fisheries, communal forests, irrigation systems and groundwater basins. She argued that common-pool resources are not necessarily satisfactorily managed *via* centralised government control. Her empirical cases demonstrated the capacity of citizens to govern common-pool resources successfully. Ostrom’s work has received wide acclaim (she received the 2009 Nobel Prize in Economic Sciences), and many scholars from different scientific fields have acknowledged her ideas about self-organisation (Ostrom 1990; and see for example the work of Haase, Lamers, and Amelung 2009; Atkinson *et al.* 2017), even beyond the narrow application to common-pool resources (e.g. McGinnis 2011; Van den Hurk, Mastenbroek, and Meijerink 2014; Van Karnenbeek and Janssen-Jansen 2018; Savini 2019).

In the field of urban planning, the concept of self-organisation gained momentum around the 1960s as a way to comprehend the complexity of city evolution (for a historical overview see Partanen 2015). The idea of self-organisation continued to be relevant in the following decades (Savini 2016a, 2016b); however, it really took off only in the aftermath of the 2008 economic crisis (Partanen 2015; Savini 2016a, 2016b; Rauws, Cozzolino, and Moroni 2020). As a consequence, a new wave of interest in self-organisation arose in urban planning, and citizens were given an increasing and more responsible role in urban development (Rauws 2016; Dembski 2020), evidenced by the emergence of more interest in self-built housing – even in countries without such a tradition as the Netherlands (Bossuyt, Salet, and Majoor 2018), and the delivery of environmental services by citizens such as energy management or green spaces (e.g. Mattijssen *et al.* 2018; Van Aalderen and Horlings 2020). In the planning literature, most scholars have praised this contemporary wave of interest in self-organisation for its potential (e.g. Portugali 2000; Boonstra and Boelens 2011; Partanen 2020; Rauws 2016; Moroni, Rauws, and Cozzolino 2020), while only a handful scholars have critically analysed its consequences or its democratic deficits (Uitermark 2015; Savini 2016a, 2016b).

2.1. From centralised to self-organised service delivery

The idea that citizens can actively deliver a service by themselves (Gofen 2015) presupposes significant reforms in public service delivery (Nederhand and Van Meerkerk 2018). Obviously, such reforms radically redefine the relationship between the government and its citizens (Savini 2016a, 2016b). Therefore, and in line with Nederhand and Van Meerkerk (2018), it is essential to identify this changing relationship.

The work of Savas (1978) provides a strong analytical framework for this endeavour. He identifies three roles in public service delivery: provider, user and arranger. The service provider is anyone who is actually producing and maintaining a public

Table 1. Types of centralised and self-organised public service delivery.

	Arranger	User	Provider
Centralised type	Government	Passive recipient	Government selects the provider
Collective self-organised type	Co-operating users	Commissioning	Co-operating users jointly select provider, ranging from the users to private or public agencies
Individual self-organised type	Individual user	Active producer (prosumer)	User

Source: Authors.

service; the service user denotes any person or organisation that is directly obtaining or using a public service, and the most important role, according to Savas' distinction of rules, falls on the service arranger. The service arranger selects the service provider and ensures high-quality service provision. Service delivery reflects the interaction between provider and user, which is organised and monitored by the arranger. In particular, the analytical introduction of the role of arranger (Savas 1977) allows for distinguishing between centralised and self-organised public service delivery. The arranger role is so intriguing because it decides *who* provides the service to citizens,² selecting a government agency, a business or even the consumers themselves (prosumers). Based on the definition of self-organisation, one centralised and two self-organised arrangements of service delivery are identified (see Table 1):

- *The centralised type.* The government arranges a provider and the user of the service is a passive recipient. Traditionally, in many Western welfare states, this hierarchical organisation was common for many public services, such as wastewater management.
- *The collective self-organised type.* Individuals co-operate in small groups to collectively arrange and commission the service. The users jointly select the provider (either directly by themselves or in collaboration with public or private agencies).
- *The individual self-organised type.* A user individually arranges the provision of the service by taking on the role of the prosumer.

With these ideal types in mind, it is crucial to explore how a shift towards self-organised service delivery (either the collective or individual type) relates to legal rules. In this article, we are particularly interested in whether self-organised wastewater management in Oosterwold is in line with the required legal certainty of environmental legislation.

3. Research design and methods

Exploring the legal regulatory compliance of self-organised wastewater management in Oosterwold demanded a detailed understanding of the specifics of the case, justifying a case study design (Yin 2009). The case study triangulated the empirical data from

legal research, document analysis and semi-structured interviews (Bryman 2008). The fieldwork took place while the urban experiment was still ongoing; however, sufficient time had elapsed to allow the researcher to study the structure and outcomes of wastewater management.

The legal analysis was qualitative and classified as doctrinal legal research (McConville and Hong Chui 2017), covering any relevant laws applicable to a particular area (Dobinson and Johns 2017). The legal research examined the content of environmental legislation and its application following a sequence of steps: selecting environmental legislation, reading the selected legislation, selecting relevant articles, summarising articles, establishing relationships between the relevant articles and applying the contents to a real-world case (McConville and Hong Chui 2017). The European Urban Wastewater Directive, the Dutch Constitution, the Water Act, the Environmental Management Act and the Soil Protection Act were the main legal documents analysed. Following Weiss (1995), coding was used to structure the obtained information into European and Dutch wastewater rules. To cross-check the findings and to limit researcher bias and knowledge gaps, several lawyers reviewed the analysis during the interviews.

A document analysis is a suitable technique for systematically examining written content (Yanow 2007). The primary aim of document analysis, in this case, was to provide a detailed description of the Oosterwold urban experiment by identifying policy aspirations, permits and agreements concerning wastewater management. It encompassed all policy documents and agreements assigned and applicable to Oosterwold: the land use plan, the development strategy, the anterior agreement (a document that deals with financial issues and liability of “plan” damage), the land transfer agreement (an agreement by residents to acquire land from the municipality) and water agreement. The researcher summarised the documents and structured the written content into codes (provider, arranger and user), to identify and describe the characteristics of self-organised wastewater management.

Furthermore, 19 key actor interviews served to develop a detailed description of Oosterwold and wastewater management, to cross-check the findings and to identify the experience of the residents and public actors (Weiss 1995). The researcher conducted pilot interviews with three key informants (two residents and the leading project member). These non-structured pilot interviews delivered a basic overview of Oosterwold and helped set up an interview guide for the semi-structured interviews (Weiss 1995). We found that it was most useful to interview people who were either knowledgeable or experienced. Next to residents, various experts were interviewed, ranging from lawyers, policymakers, project members and environmental specialists. The interview guide was adapted to the interviewees’ skills and knowledge. During each interview, the researcher ensured the respondents’ anonymity. The interviews were transcribed and analysed based on coding of legal rules (European and Dutch) and wastewater management (provider, arranger and user). The next sections discuss the empirical details related to the case, providing a historical perspective on wastewater management, followed by the legal context of wastewater management, and closing with the specifics of wastewater management in Oosterwold.

4. A historical perspective on Dutch wastewater management

Today, it is common for wastewater to be collected, purified, and, to an increasing extent, reused; however, such comprehensive wastewater management was not always

the norm. During the Industrial Revolution, cities suffered from poor quality of surface water due to explosive population growth. Poor water quality resulted in extremely unhygienic conditions leading to outbreaks of diseases and epidemics (Van den Noort 1990; Obani and Gupta 2016). In the nineteenth century, fundamental experiments were carried out to collect and transport wastewater by wastewater disposal systems; a centralised system of sewers, aimed at draining rainwater and wastewater, was designed (Schaum 2018). Decades later, the harmful environmental impacts of discharged wastewater were very visible, contributing to the eutrophication of rivers, lakes and coastal waters (Van der Hoek, de Fooij, and Struker 2016). This evidence underscored the need to treat wastewater before discharging it into surface waters. The sewage infrastructures are, as a result, connected to wastewater treatment plants. Contemporary views, as Van der Hoek, de Fooij, and Struker (2016) highlight, even take an additional step and consider wastewater as a reusable resource. This reuse is considered highly significant due to the increasing resource pressures and the drive to create sustainable environments (Kennedy, Cuddihy, and Engel-Yan 2007).

In the Netherlands, almost all buildings and houses have been connected to a sewage system since the Industrial Revolution.³ The latest information from 2020 shows that the Netherlands has about 150,000 km of sewerage lines within the centralised, public system, covering almost 99% of the population (RIONED 2020). Individual sewage systems in the Netherlands are thus rare and found only in remote rural areas. Most buildings have a combined system in which both rain- and wastewater go into the same pipes, while newer buildings have separated lines. Several cities are currently replacing old sewage systems with these new systems, and all new construction projects are built with this new system. Furthermore, the Dutch sewage system is connected to several wastewater treatment plants, where the wastewater is treated and reused before being discharged into open surface waters. The Netherlands has about 327 wastewater treatment plants, owned by 21 water boards (RIONED 2020). Within these wastewater treatment plants, about 90% of wastewater from businesses and almost 100% of wastewater from households is treated and reused. Clearly, the Netherlands has a strong tradition of centralised wastewater management.

5. The relevant legal rules

Wastewater management is considered a public good for the benefit of humanity and the environment (Obani and Gupta 2016). It is within this context that wastewater management is legally institutionalised on a variety of scales, ranging from European, national, provincial to the local level. The legal rules for wastewater management pertain to collecting, transporting, purifying and disposal of wastewater and are aimed at protecting – and even improving – human health and the environment (Garrone *et al.* 2018). This section provides the legal context applicable to the Netherlands. The European Urban Wastewater Directive is the essential legislation governing wastewater, providing an umbrella framework for protecting water quality and minimising the adverse impacts of wastewater discharge.⁴ This European legal perspective resonates with the Dutch Constitution, which requires the government to ensure and prioritise human health, environmental protection and environmental improvement (Article 21⁵ and 22⁶). The Water Act, the Environmental Management Act and the Soil Protection Act provide the national legal framework, drawing their legal basis from

existing EU legal frameworks (for a detailed legal overview see the work of Keessen, Van Kogelenberg, and De Graaf 2018).

The Dutch Environmental Management Act (EMA) sets out the legal rules concerning the collection and transport of wastewater. Section 10.33 of the EMA imposes a municipal duty to collect and transport wastewater by a sewage system within the municipal territory. The connection to a sewage system is mandatory in all agglomerations of more than 2,000 inhabitants. Section 4.22 of the EMA requires the municipality to draw up a municipal sewer plan that describes the characteristics of the sewage system. A municipality can request a waiver for the sewage system from the province only if it would benefit effective wastewater management. A province has the exclusive right to grant exemptions from the sewage system mandate⁷ when the choice is substantiated and ensures the same degree of environmental protection. The municipality must include and ground the choice for an alternative collection system in the municipal sewer plan. Under the EMA, the municipality can never abandon or transfer its provision and quality assurance duty (Keessen, Van Kogelenberg, and De Graaf 2018). Also, the municipality levies a charge on property users to recover the costs of collecting and transporting wastewater (Lindhout 2013).

The Water Act regulates the legal rules on the purification of wastewater. Until the late twentieth century, contaminated wastewater directly discharged into surface water. From the 1970s, the commencement of the Dutch Surface Water Pollution Control Act (in 2009 replaced by the Water Act) prohibited this practice. The Water Act states that wastewater must be purified before its disposal. In Section 3.4, the act mandates the water board to take care of wastewater treatment (again, water agencies cannot release themselves from this duty). The water board established (and owns) wastewater treatment plants to execute this duty (Keessen, Van Kogelenberg, and De Graaf 2018). The European Urban Wastewater Directive sets minimum standards for treatment and maximum standards for emissions of pollutants, particularly nutrients and organic loads. In the Netherlands, wastewater treatment plants must purify wastewater following a tertiary treatment to reduce the discharge of phosphorus and nitrogen (Keessen, Van Kogelenberg, and De Graaf 2018).^{8,9}

The Water Act, the Environmental Management Act and the Soil Protection Act lay the foundations for discharging wastewater. The Water Act regulates the discharge of purified water into surface water and designates the water board as the legally responsible authority. Concerning the taxes for treatment and discharge of wastewater, the water board is entitled under the Water Act to charge a wastewater treatment levy and a pollution levy, in order to ensure water quality. The wastewater treatment levy is charged to cover the costs of treating wastewater to all households connected to the sewer system. The pollution levy is aimed at households that directly discharge wastewater into surface waters. The water board sets effluent charges following the polluter pays principle (Vollebergh and Dijk 2017).

6. The Oosterwold development

At the eastern tip of the conurbation of Amsterdam lies the new town of Almere. The government initiated and planned Almere as a greenfield development, following the modernist principles popular at the time. It was this unquestioned belief in governmental control that eventually provoked a counter-reaction. At the beginning of the twenty-first century, planners and politicians were fundamentally dissatisfied over the

dominant interest of the government in Almere's rational-comprehensive planning. This counter-reaction produced a vision to further develop Almere based on self-organisation and the logic of incrementalism. A committed social-democratic alderman eventually operationalised this vision through a wide range of policy aspirations, such as self-built housing (Bossuyt, Salet, and Majoor 2018) and incremental development strategies (Van Karnenbeek and Janssen-Jansen 2018; Van Karnenbeek *forthcoming*). It is in this context that the urban development experiment of Oosterwold originated in 2012.

Oosterwold is located at the municipal borders of Almere and covers an area of circa 4,000 hectares, which was previously agricultural land, offering many options for development and experimentation. The main philosophy of Oosterwold is to empower citizens (hereafter residents) and to develop the site incrementally. Residents must build their own houses, generate their energy, purify their wastewater, practice urban farming, and develop and maintain public spaces and roads (Cozzolino *et al.* 2017). The urban experiment develops incrementally as residents gradually buy plots on the site. It was set up by the Municipality of Almere, in collaboration with the Government of the Netherlands, the neighbouring Municipality of Zeewolde,¹⁰ the Province of Flevoland and the regional water board (hereafter "public actors"). These public actors opted for an incremental development strategy based on self-organisation to counter overregulation and to empower residents through a radical experimental format. As highlighted by a project member, "it is against everything [...]. If people are allowed to do it themselves, then there is an actual change in society".

For the public actors to succeed in the experiment, they deviated from the existing planning and environmental rules and devised "experimental" rules (under the Dutch Crisis and Recovery Act), among other things granting relatively high autonomy to residents. However, the philosophy does not go so far as to claim that "anything goes". The public actors prescribed broad guiding principles for Oosterwold: residents have free choice of a plot, yet within a fixed division of space; there are some restrictions on construction; residents must comply with health and environmental standards, and residents must be self-sufficient in wastewater and road infrastructures. The public actors emphasised that the idea of self-organisation advances the realisation of an ecologically and socially sustainable city.

7. Self-organised wastewater management in Oosterwold

Oosterwold is thus a radical development project that experiments with self-organisation in a semi-urbanised environment. The experiment firmly called into question the Dutch centralised wastewater management tradition, in place ever since the Industrial Revolution. For the public actors to enable self-organised wastewater management, they radically changed their roles and the role of residents through "experimental" rules. This section describes the self-organised wastewater arrangements in Oosterwold according to the most significant role changes along the arranger, provider and user archetypes:

The user as the arranger: The public actors in Oosterwold decided not to install a centralised sewage system. Without a sewage system, the public actors enabled citizens to develop the site incrementally. In line with legal requirements, the Municipality of Almere explained this choice in the municipal sewer plan. Unlike legal requirements, the Municipality of Almere did not request a waiver for a sewage system mandate from the Province of Flevoland. Despite the absence of this waiver, residents had to

arrange their own wastewater management, that is, residents had to select the service provider. By arranging the service provider, residents had to ensure that the provider delivered infrastructures that complied with the requirements set in a discharge permit. The public actors required residents to apply for a discharge permit that was managed by the water board to protect the quality of surface water and to safeguard public health. Therefore, residents have an obligation to ensure that the selected providers deliver wastewater infrastructures that meet all requirements as prescribed in the permit. The water board is required to check these infrastructures several times a year to make sure residents are continually meeting the requirements. The water board is obliged and mandated to take actions if residents do not comply with the standards. Except for the requirements in the discharge permit, the public actors did not prescribe details regarding the infrastructures to be used. In principle, residents could arrange providers individually or collectively. As can be read in the land use plan (Gemeente Almere 2016, 18), “residents organise wastewater management themselves, probably not on an individual scale but collective scale”. Nevertheless, most residents opted to independently organise as individual service providers.

The user as the provider: Nearly everyone opted for a sewage facility that collects, treats and disposes of effluents on the plot of land that produces the wastewater. These onsite sewage facilities (OSSFs) are primarily designed to treat and dispose of effluents on an individual scale. Based on the treatment of wastewater through performance requirements, OSSFs are categorised into multiple intensities. The higher the category number of an OSSF, the more substances are purified. The set requirements in the discharge permit prevented the use of conventional OSSF I (such as septic tanks) and implicitly directed residents to opt for an OSSF III, which purifies organics, phosphate and nitrogen. At the time of writing (January 2020), nearly everyone in Oosterwold has installed an OSSF III onsite. Residents with an OSSF are financially levied for pollution.¹¹

The user as the active producer (prosumer): The public actors obliged residents to sign an anterior agreement in which residents agree to collect, treat and dispose of wastewater, as a prerequisite for residing in Oosterwold. In contrast to the passive role of users in centralised wastewater management, residents in Oosterwold have assumed an active role in the delivery of wastewater services.

8. The complications of self-organised wastewater management in Oosterwold

In Oosterwold, the public actors plucked up the courage to let residents organise wastewater management; however, the shift towards self-organised wastewater management was fraught with many complications. To begin with, the water board concluded that many OSSFs did not meet the requirements of the discharge permit. Regularly, the water board performed multiple measurements in Oosterwold. At the beginning of the project, one measurement showed that 28 of 40 OSSFs failed to meet these requirements. As a consequence, efforts have been taken to improve the functioning of the OSSFs (e.g. the Municipality of Almere helped residents secure expert support). However, a more recent measurement in November 2019 showed that more than one-quarter of OSSFs (33 of 199) still do not meet the requirements, despite the efforts taken. Several reasons underpin the persistently poor performance.

First, the operation of an OSSF is based on experimental tests in laboratories, and while proven in a laboratory setting, the real-life application was more problematic.

The systems do not purify all mandated substances, underpinning the system's technological vulnerability. Technological research into this case concluded that the purifying effects are limited due to insufficient phosphate removal and the absence of hard water. Furthermore, OSSFs need large water flows to function properly, yet residents use water sparsely (Centre of Expertise Water Technology 2019). Second, illicit materials or liquids occasionally end up in an OSSF (such as chlorinated cleaning materials, disinfectants, diapers), risking system failure. As LaGro, Vowels, and Vondra (2017) point out, individuals do not always know how to use and maintain the system. Also, in addition to the inadequate functioning of some OSSFs, these infrastructures are (to date) less clean and sustainable compared to conventional centralised wastewater systems. As a project member explained, "currently, the sewer is of better quality. All filter systems [OSSFs] still cause some water and soil pollution". Further, OSSFs are not designed to reuse effluents from wastewater, such as materials and toxic substances. In other words, the centralised wastewater system in the rest of the town of Almere functions more sustainably than the self-organised system in Oosterwold. In Almere, all buildings are connected to a separate sewage system that transports wastewater to treatment plants in the province. In these treatment plants, the waters are biodegraded and used for the production of biogas (Gemeente Almere 2017).

Furthermore, the incremental development strategy directed residents to arrange self-organised wastewater management on an individual scale. As the urban development proceeded, more and more inhabitants were gradually moving into the vast area of Oosterwold. As future residents may choose any plot of land, cooperation among individuals was exceptionally complicated, as residents did not know where or when potential neighbours would settle. This made it hard to set up decentralised systems of wastewater management beyond the level of individual solutions (such as collective self-organised systems). As a result, a growing number of residents are setting up individual wastewater facilities. Because OSSFs cause some pollution, the increase in individual wastewater facilities is increasingly frustrating effective wastewater management. Although the pollution of some OSSFs is negligible, the cumulative effect of hundreds of OSSFs is much more dangerous. As a project member from the Municipality of Almere asserted, "in the end, there is a concern that the cumulative effect of all individual systems leads to a [environmental] problem. There will be a tipping point in which it is no longer sufficient".

Taken together, the combination of the self-organisation philosophy and the incremental development strategy triggered residents to opt for individual onsite sewage facilities. Eventually, the technological and social vulnerabilities, as well as the large number of OSSFs, contributed to serious deterioration of water quality, with potential risks for human health. Due to these adverse effects, the public actors felt the urge to organise collective action through a cooperation agreement (2018) and a living lab, in order to find solutions for more effective wastewater management and to ensure compliance with environmental standards (e.g. by testing technological innovation to purify wastewater). Despite these efforts, in the spring of 2020, the public actors announced that they will give up on individual onsite sewage facilities for future developments.¹² The tipping point, when water quality standards will no longer be met, has almost been reached, and there are no clear future improvement prospects under the current system. From now on, residents who operate an effective OSSF system may keep it; however, future residents and residents with inadequate OSSFs will be connected to the sewage system.

9. Discussion: mismatch between legal rules and self-organised wastewater management

The Netherlands has a long tradition of government commitment to wastewater management, striving for centralisation backed up by its environmental legislation. The duty of care principles of the municipalities and water boards pave the way for the organisation of wastewater management by sewers and treatment plants. The case of Oosterwold is the first radical experiment with self-organised wastewater management that truly challenged this centralised approach. The analysis reveals that the role of the residents in Oosterwold dramatically changed from passive recipients to active prosumers. Interestingly, all residents independently arranged themselves as providers by installing individual wastewater facilities, which is consistent with the *individual self-organisation* type.

Concerning the legal requirements of water quality, it is noticeable that this individual self-organised wastewater management created various legal inconsistencies, such as the delegation of municipal care, the absence of a waiver and the deterioration of water quality. The experiment seems to assume that the legal obligation of the municipality and the water board is transferred to residents. However, it is important to keep in mind that this duty of care principle can never be transferred formally. Furthermore, the Municipality of Almere did not request a waiver because the same degree of environmental protection could not be secured. The Province of Flevoland tolerated this municipal decision because they co-initiated the experiment. Even more importantly, despite various attempts by the public actors to consider environmental and health standards (such as discharge permits and periodic checks by the water board), the combined effect of having many individual wastewater facilities was deteriorating the water quality, with potential danger to human health. Therefore, the experiment of self-organised wastewater management did not correspond to the required legal certainty that protects the environment and human health. Evidenced by the fact that the experiment almost reached its tipping point, the individual self-organised wastewater management in Oosterwold is a showcase of a mismatch between the outcomes of self-organised service delivery and the relevant environmental legislation.

While multiple reasons explain this mismatch, the origins of these reasons emanate from the following: (1) the *incremental development strategy*, (2) the *scale* of the urban development project or (3) the *vulnerabilities* of OSSFs. First, due to the incremental development strategy, cooperation among residents was exceptionally complicated, forcing residents to arrange and provide individual solutions, thereby forestalling collective self-organised arrangements. Second, the development's large scale introduced too many individual wastewater operations into the system. The cumulative effects of 100s of OSSFs enhanced the risk of environmental failure. Third, current OSSFs are characterised by technological and social vulnerabilities, such as insufficient phosphate removal. The sum of these reasons eventually led to inadequate collection and purification of wastewater and even prevented the reuse of wastewater. Therefore, the individual self-organised wastewater management experiment could not satisfy the legal rules and was discontinued.

10. Conclusion

This article enriches the discussion about self-organised environmental services with a perspective on meeting the required legal certainty of environmental legislation,

specifically in the case of wastewater management in Oosterwold. The radical experiment of the case critically reflected on the traditional practices of centralised wastewater management. The case demonstrated that the consequence of the individual self-organisation type fell short of satisfying the relevant environmental legislation. From the perspective of the required legal certainty of environmental legislation, it can be concluded that individual self-organised wastewater management in Oosterwold failed. However, this does not automatically mean that the idea of self-organisation always fails or that centralised public service delivery by the government is always the best fit for wastewater management, nor that legal rules are always impediments to self-organisation. Rather, the conclusion is that the success or failure of self-organisation in delivering environmental services like wastewater management critically hinges on ensuring compliance with environmental legislation (water quality requirements in particular).

Based on the in-depth research of the Oosterwold experiment, this article provides a suggestion on how to facilitate compliance with environmental legislation in the individual self-organised type. The article suggests that the individual user cooperates with a middle-man in arranging the service (Savas 1978), that is, someone who ensures compliance with environmental legislation and carefully monitors the collective by making sure that individual choice does not lead to multiple individual failures. More research is required to further explore self-organised arrangements for wastewater management that can satisfy relevant environmental legislation. Some suggestions for future research include (1) to explore the potential for collective self-organised arrangements of wastewater management in terms of environmental legislation, or (2) to experiment with self-organised wastewater management on a smaller scale. The in-depth research also provides two lessons with broader significance. First, the combination of the self-organisation philosophy and the incremental development strategy might be an obstacle to collective action. Second, the cumulative effects of 100s of OSSFs and the inadequate use of these systems (such as reduced water flow and domestic carelessness in disposing of illicit materials) negatively influence water quality. Finally, we want to acknowledge that the experiment presented in this article is context-specific. However, it should be noted that, in many Western welfare states, the ideology of self-organised environmental service delivery is gaining momentum. We posit that this study might help to formulate future research hypotheses about self-organised environmental services that have historically been administered under public control.

Notes

1. “The challenge of how to improve on regulation in such a way that it guides local practices in a normative sense but simultaneously enables optimal use of local – context bounded – option space” (Salet and De Vries 2019, 189).
2. Self-organization is not a synonym for self-provision.
3. Except from several remote buildings and houses in the meadows.
4. The European Urban Wastewater Directive stipulates appropriate collection systems and treatments in all agglomerations of more than 2,000 inhabitants (Garrone *et al.* 2018).
5. “It shall be the concern of the government to keep the country habitable and to protect and improve the environment”.
6. “The government shall take steps to promote the health of the population”.
7. This legislation is aimed in particular at remote farms (Keessen, Van Kogelenberg, and De Graaf 2018).

8. A second stage of treatment is obligatory for agglomerations of 2,000 inhabitants, while a tertiary stage is mandatory for agglomerations of over 10,000 inhabitants (Garrone *et al.* 2018).
9. Due to growing environmental concerns (Van der Hoek, de Fooij, and Struker 2016) and increased awareness regarding substances such as pharmaceuticals (Schauam 2018) and micro-plastics in wastewater (Keessen, Van Kogelenberg, and De Graaf 2018), it is expected that the European Water Framework Directive will impose stricter requirements for purifying wastewater in the near future.
10. The Oosterwold development is also located in the Municipality of Zeewolde. Up to 2020, only one-third of Oosterwold has been made available for development, and this area is located in the Municipality of Almere.
11. Obviously, they do not pay sewer or wastewater treatment levies.
12. The decision to give up on self-organized wastewater management was also influenced by the very high transaction costs of the water board (setting up discharge permits, checking individual systems).

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