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CHAPTER 5

Envisioning the Future of Water in the UK: Exploring Digital Water, Its Imaginaries, and Spatial Implications

Christina Walter

1 Introduction

Water, as well as our relationship with it, is being transformed to react to climate change, rising water demand, and quality issues (Sarni, 2020). This transformation coalesces with the increasing implementation of digital technologies in the water sector, comprising both hardware and software. Hardware includes, for example, smart pumps, water meters, and sensors to measure different aspects of water quality. New software solutions process data for monitoring water flows throughout the networks using artificial intelligence (AI) or machine learning, and are able to model and predict water demand in an area. These technological developments are discursively tied to specific visions of the future as "the future of water is digital" (Sarni, 2020). Recent developments in the English water sector promote the application of digital technologies as exemplified in the Strategic Pipeline Alliance (SPA). The Strategic Pipeline Alliance (SPA),

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located in the East of England, is one of the biggest water infrastructure projects in the UK and aims to address future water shortages by transporting water from “wetter to drier areas of the region” (Anglian Water, 2023a; Mann, 2020). By realizing this project, pertinent visions of the future have strong implications and effects on the production of space.

With the increasing adoption of digital water technologies, their role in the production of space increases, above all by creating new regions of water exchange and management. In this contribution, I want to sketch out some of these spatial reconfigurations that are constituted through the construction of the Strategic Pipeline Alliance Project. For this chapter, a discourse analysis around the topic of digital water was conducted. It identified technological solutionism and sociotechnical imaginaries as the two central strands of argument (Walter, 2024). On the one hand, there is a prevailing technological solutionism (Morozov, 2013) in the discourse, presenting digital technologies as the only viable solution to challenges within the water sector. On the other hand, sociotechnical imaginaries (Jasanoff, 2015) of the future constitute digital tools of water management as a new technical and economic pathway within the water sector, resulting in positive and optimistic future outlooks for the sector and beyond. I assess these two main lines of argument to critically examine the Strategic Pipeline Alliance project.

At first, the Science and Technology perspective of sociotechnical imaginaries is introduced. This is followed by a section on the concept of technological solutionism and the sociotechnical imaginaries which are deeply embedded within the digital water discourse and its practices. Then, the Strategic Pipeline Alliance project and the infrastructural and spatial implications of the related future visions are highlighted before the main findings are concluded.

2 Sociotechnical Imaginaries of the Future

Claims, promises, and descriptions of possible futures have been studied from the perspective of Science and Technology Studies (STS), among others (e.g., Future Studies). Statements regarding the future are performative as they not only describe what the future may bring, but also how the expectations, visions, and anticipations expressed influence what might happen (Konrad et al., 2017). Narratives about the future legitimize research, policies, or technologies in different sectors and guide the general societal discourse on how the grand challenges of the twenty-first century should be addressed (ibid.). STS has investigated the future from different vantage points such as expectations, visions, and sociotechnical imaginaries. Sociotechnical imaginaries are defined by Jasanoff (2015, p. 4) as:

> collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology.

These futures are generally rooted in positive visions of progress; thus the term *desirable futures* is often used (Jasanoff, 2015). Studies on sociotechnical imaginaries have, hence, concentrated on how imaginaries legitimize or delegitimize certain future pathways; thus current power relations are deeply embedded within them and modify expectations and visions (Konrad et al., 2017). Multiple imaginaries can simultaneously prevail within a society, either in a productive dialectal relation or in opposition to each other as counter-imaginaries (Jasanoff, 2015). Powerful actors such as courts, institutions, or the media then define or promote the dominant imaginary supporting their position and thus shape the broader societal future discourse (Jasanoff, 2015). Generally, sociotechnical imaginaries need to align with existing cultural norms, values, and structures, as well as with the material infrastructure, and economic and political systems to be implemented successfully (Sadowski & Bendor, 2019). Jasanoff (2015, p. 4) emphasizes that imaginaries "encode not only visions of what is attainable through science and technology, but also of how life ought, or ought not, to be lived; in this respect they express a society's shared understandings of good and evil."

Studying sociotechnical imaginaries reveals the intertwining and complex sociotechnical arrangements between society and technology (Fouché, 2017). Thereby, technology is often considered from two different vantage points. Firstly, how the development of new technologies is influenced by humans, and secondly, how humans are impacted by the development of technologies, e.g., infrastructures, networks, or technological systems (Fouché, 2017). For the case of water infrastructures, Furlong (2010) studied the introduction of water efficiency technologies serving as *mediating technologies* in Canadian water utilities. Furlong (2010, p. 460) defines mediating technologies as "small devices that can be added to an infrastructural network with the intention of modifying its performance (e.g. efficiency technologies)." She showed that the integration of mediating technologies into infrastructure networks leads to shifts in both the sociotechnical and environmental relations within the cities. Thus, digital water technologies such as sensors, digital water meters, pumps, or software solutions can be understood as mediating technologies. Coutard et al. (2005, p. 1) argue that water infrastructures are "well-developed and long-lasting infrastructures" and are therefore one of the least flexible infrastructures. Adopting digital water technologies can alter the relations between the technical network and other actors such as consumers, institutions, or nature within an (urban) water system in planned and unforeseen ways.

3 Technofixes and Technological Solutionism in Digital Water

The critical debate around the concept of the technological fix criticizes the common mindset that social and ecological problems can be solved using technologies (Dickel, 2021). For example, solutions claiming to create a sustainable future through the adoption of digital innovations such as smart metering or remote interactions with virtual technologies are suspected of merely being technological fixes (Dickel, 2021). The term *technological fix* originated as a positively connoted concept of rational problem-solving and was coined by Alvin Weinberg, who characterizes a technological fix as the transformation of a social problem into a technological one. Once the problems are framed technologically, they are easier to define, which in turn also limits the space for solutions, as due to the redefinition only certain technical means are possible to solve the problem (Dickel, 2021; Johnston, 2018).

Since the early 1970s the term *technological fix* has been used more critically (Rosner, 2004). According to Rosner (2004, p. 3), the phrase has since then been "seen as partial, ineffective, unsuccessful, threatening; one-sided as opposed to holistic; mechanical as opposed to ecological." Today, if something is regarded as a technological fix, it typically implies a separation of the domains of technology, nature, and society (Dickel, 2021). In the field of Urban Planning and Architecture, the strong belief in positive outcomes of technological solutions was termed "solutionism" (Murphy, 2012). Solutionism can be defined as the idea that there is a technological fix to every social problem (Morozov, 2013). For Morozov

(2013), the ideology of technological solutionism legitimizes and sanctions actions that presuppose rather than investigate the problems they seek to solve. Technology, as a generalized interpretation and practice of modernity, allows technical applications to appear as solutions to major social problems (Dickel, 2021). Moreover, technological fixes would ensure stability, indicating that it was not necessary for society to change their way of life and individual behavior as technical innovations secured the current mode of existence (Lyons, 2011).

David Harvey (2001), who coined the notion of the *spatial fix*, deliberately aligned it with the idea of the *technological fix*. The *fix*—regardless of whether if it is spatial or technological—is a structural process producing power relations. It temporarily acts as a solution or stabilizer for the observed case, but later generates new problems (Ekers & Prudham, 2017; Svarstad et al., 2018). Importantly, these solutions in technological fixes tend to address the symptoms rather than the social and economic causes of environmental pollution and resource consumption (Dickel, 2021). This is also the case in the field of digital water: while digital technologies (e.g., sensors, AI models, meters) might allow for better knowledge and monitoring of the water quantity in a region, they still do not solve the underlying causes of water scarcity. Rather, they stabilize and conserve the dominant power relations around water provision.

4 Future Imaginaries of Digital Water

Constructions of the future have notably been studied in STS by Jasanoff and Kim (2015) as well as Beckert (2016). Both criticize the prominent notion of path dependency for being historically deterministic, and both argue against individualistic conceptions of imaginaries (Hajer & Pelzer, 2018). Both propose that imaginaries should be analyzed from a performativity perspective and highlight the necessity to investigate the institutional and sociotechnical context or practice from which shared future visions arise (Hajer & Pelzer, 2018). Beckert (2016) examines how imaginaries of shared economic futures are constructed through specific knowledge instruments. He detects that most major social-theoretical concepts apply the concept of path dependency to explain the present from the past (Beckert, 2016). In contrast to the historically deterministic perspective applied by Beckert (2016), Jasanoff and Kim (2015) analyze socio-technological systems, by relating imagination to both wider material and social dimensions, with a strong perspective on "desirable futures" stimulating sociotechnical developments in the present (ibid., p. 2). Imaginaries of the future are also prominently transported within the discourse of digital water, generally linked to a positive outlook for the water sector in general. The implementation of digital technologies, for instance artificial intelligence, is instrumental for this, as "AI has an increasingly important role in the water sector and it is likely to increase in the future"[1] (Guida, 2020). New technologies are seen as the way to improve the water sector and ensure that the sector will be set for the future.

Future imaginaries within the discourse on digital water are not neutral as they convey a modernization trajectory (Anand, 2017; Gupta, 2015; Howe et al., 2015). Modernization trajectories conceptualize the future through notions of innovation, progress, and improvement, presuming the future will imply improvements compared to the present, as the present itself is full of improvements compared to the past (Delanty, 2021; Wagner, 2016). This also solidifies the collective belief in the desirability of technologies and their power to solve our current problems in the future. However, Adloff and Neckel (2019) argue that the future encompasses multiple trajectories and can also be envisioned in another way. Doubt as to what the future may hold for society is expressed in many spheres of our everyday lives (Oomen et al., 2021). This uncertainty is especially common regarding the impending threats of ecological catastrophes and social inequalities (Krznaric, 2019). Thus, future visions of those risks are intertwined in the public imagination along with visions promoting and evaluating specific technologies (Oomen et al., 2021).

This, again, can also be observed in the general discourse on digital water. Salguero (2021) states that "[t]here are many threats ahead for utilities, such as […] escalating demand for water, […] due to a growing population; […] overexploited, finite resources, and inefficient and ageing infrastructures. The only tool that companies can rely on to achieve efficient management is the use of new technologies." This further emphasizes arguments for uncertainty due to global challenges and specific risks in the water sector, with technologies as the way to achieve this desirable vision of the future. The imaginaries conveyed through the discourse on digital water as well as the anticipated establishment of digital water infrastructures result in new forms of power, shaped through standards, rules, and regulations that are institutionalized by technology companies,

[1] Stated by Professor Kapelan in an interview with the International Water Association.

utilities, or other influential actors (Björkman, 2018; Carse & Lewis, 2017; Cousins, 2019; Picon, 2018).

5 Case Study and Methodology

The Strategic Pipeline Alliance aims to secure water supplies for future generations as well as to improve drought resilience in the East of England, achieved by moving water from the "wettest areas in the north of our region to the driest areas in the south and east, where water isn't as easily sourced" (Anglian Water, 2023b).

Construction for the SPA started in the summer of 2021 and the network is expected to be completed by the summer of 2027 (Kanaris, 2024; Pashby, 2024). However, the end date of the project has been delayed multiple times due to the pandemic, the 2023/2024 winter turning out to be the wettest on record, as well as steel supply issues (Anglian Water, 2024; Pashby, 2024). Within the SPA project, 330 km of pipeline are being built, stretching from North Lincolnshire to Essex in the south, with pumping stations and storage reservoirs throughout the region. This network will be accompanied and monitored by a digital twin (Anglian Water, 2024; Anglian Water Services, 2025; Gregor & Stirland, 2019; Gregory, 2022). Figure 5.1 shows the route of the pipeline in the East of England as well as the pumping stations and water storage tanks. After completion, the SPA is expected to address a water shortage of 30 million liters a day, estimated for the East of England in the future (Chambers, 2021). James Crompton, the SPA director for Anglian Water, argues that "[t]he strategic pipeline is vital in addressing the predicted *jaws of death* moment for water availability in the East of England – the point at which demand for water greatly outstrips the available supply" (Taylor, 2022). Due to population growth in the region, this prediction could prove true as soon as 2030 without the SPA project (Anglian Water, 2023c).

The discourse analysis conducted examined 89 web texts from international websites[2] specifically targeted toward professionals working in the water sector or related sectors such as infrastructure provision or civil engineering. As keywords, *digital water*, *digitalization of water*, *digitalization of the water sector*, *digitalization of the water industry*, and *AI for water* were used to find suitable texts. The selected texts were coded and

[2] Such as aquatechtrade.com, iwa-network.org, smartwatermagazine.com, or waterworld.com

Fig. 5.1 Map of the Anglian Waters Strategic Pipeline project. Source: Author's own representation according to Anglian Water, 2024

analyzed to gain insights into the topics, the argumentative and narrative structure, as well as the typical linguistic terms utilized within.[3] The discourse analysis around the topic of digital water identified technological solutionism and sociotechnical imaginaries as the two central strands of

[3] For more information on the discourse analysis of digital water, see the 2024 publication "Digital Technologies for the Future of the Water Sector? Examining the Discourse on Digital Water" published in Geoforum 148, 103918.

argument (Walter, 2024), as presented in the previous sections. These two strands of the discourse were critically examined and applied to the Strategic Pipeline Alliance (SPA) case study, which consisted of an analysis of the SPA's promotional materials, and online posts, as well as expert interviews with SPA stakeholders, to reveal the spatial implications that can unfold from visions enmeshed in large-scale infrastructure projects.

6 Solutionism and Spatial Fixes in SPA

Solutionist thinking is prevalent in the discourse around the SPA project, establishing an infrastructure network the success of which "is fundamental to supplying free flowing water throughout the region, making us more resilient to risks of drought" (Anglian Water, 2023b). Here, the pipeline project is being directly linked as a solution to address the looming future threats of drought in the East of England. It is portrayed that the future challenge of drought or water shortages in the region will be solved or at least reduced, as the SPA "is one of the largest infrastructure projects in Europe […] [and] will help tackle future water shortages" (Anglian Water, 2023b).This will be supported by the introduction of "cutting-edge digital infrastructure — a digital twin — which will mirror the physical infrastructure, providing real-time data to drive insight, helping us to monitor and optimize the Anglian Water network" (Anglian Water, 2022, p. 13). In framing infrastructures and digital technologies as the only solution to current and/or future water challenges, the discourse consolidates techno-optimist positions, rendering alternative solutions or ways to overcome them more difficult to implement or even think about. Through these statements, technology is, on the one hand, directly associated with a socio-natural phenomenon (e.g., the hydrosocial nature of water), while, on the other, it is understood as the only solution to current natural and social problems (e.g., climate change, increasing water demand). Therefore, this solutionist thinking entails a depoliticizing element. Popartan et al. (2022, p. 7) argue that the introduction of AI decision-making algorithms in the water sector "may consolidate the already reductionist and depoliticized water governance perspective that is dominant nowadays." It is important to understand that managing water is not just a technical field, concerned with the provision of water infrastructure, but also a political field as it entails human values, behaviors, and organizations.

When completed, it can be argued that the SPA project will represent a new spatial fix (Harvey, 2001), connecting regions of different water availability with each other. Anglian Water (2023a) states that "the pipeline will allow us to move water from areas of surplus to areas in deficit," resulting in pumping water from the North to the South, as the northern part of the region is generally wetter than the South. Additionally, licenses issued by the Environment Agency regulate water abstraction to make sure not to over-abstract from groundwater bodies. Thus, Anglian Water "must reduce the amount of water [they] take from sensitive areas like chalk streams in the south and east of [their] region" (Anglian Water, 2024). This further increases the dependence of the southern region on the North. Furthermore, storage reservoirs—holding around 20 million liters of water—will be built to ensure continuous water flow and supply for the growing region, without imposing drastic behavior changes regarding water use by the local population (Anglian Water Services, 2025).

7 Infrastructural and Spatial Implications of the SPA's Future Vision

Visions of the future are materialized through large-scale infrastructure projects. New infrastructures are considered as "future proof" by their designers (Edwards et al., 2009, p. 371) as well as "promises made in the present about our future" (Appel et al., 2018, p. 27). Therefore, infrastructures are the material manifestation of future visions and anticipations (Cousins, 2019; Howe et al., 2015; Larkin, 2018). Visions of water futures are created and distributed through the discourse around digital water, constructing a dominant trajectory for advancing the water sector. According to Delanty (2021, p. 2), the future can be seen as the "product of the present and the choices made in the present"; thus "the future is now". Within the SPA project, this path is apparent in statements such as "Future proofing our water supplies" (Anglian Water, 2023b). The way to achieve this future is through implementing digital technologies—in the case of the SPA, it is the digital twin that combines hardware and software and is seen as a powerful tool to monitor and manage water transfers throughout the region when and where needed.

At the same time, infrastructures preserve the social and cultural settings of the time they were first created and are thus always historically rooted (Howe et al., 2015). This applies not only to building infrastructures but likewise to "more liquid-like channels of infrastructures [such as] digital flows […] as technology and demands for data […] ebb and flow" (Howe et al., 2015, p. 8). Today, code is everywhere; thus Kitchin and Dodge (2014) introduced the concept of code/space where software and the spatiality of everyday life co-constitute each other. Ash et al. (2016) argue that this results in the blending of space and code. Technological processes link the digital and physical spaces and their relations (Maciej, 2024). In the following, two spatial implications are discussed, (1) the establishment of new physical water infrastructures and (2) the creation of digital spaces and their spatial impacts.

(1) Physical water infrastructures—especially pipes—often go unnoticed, as they are buried underground and not visible on a daily basis. Only if a disruption, such as leaks or pipe bursts, occurs and maintenance is needed do their existence and importance for our everyday lives become apparent. In the case of the SPA project, a new pipeline is being built and during this process, the infrastructure is visible, until it will (mostly) become *invisible* again after completion. While the pipeline itself will be completely underground, the pumping stations will be visible overground. The SPA project is envisioned as a *spine* holding together the region and leaving "a green and social legacy" (Anglian Water, 2024). The pipeline itself is made from a mix of steel pipes and polyethylene pipes, catering to different expected volumes and water pressures. While steel pipes are used in the northern section between Elsham and Peterborough, the smaller polyethylene pipes are installed in the southern section (Kanaris, 2024). As the construction process disrupts natural spaces and often occurs close to local communities, Anglian Water openly communicates about the project and its importance for the overall vision of a water-secure future. To reach this goal, Anglian Water is engaging its pipeline workers in various community projects. As part of these, Anglian Water has "donated more than 2,500 books to primary schools and proactively work[ed] with children on literacy development, planted thousands of trees to boost biodiversity, built special *commuter* fences to help bats with their navigation and donated life-saving defibrillators to communities" (Anglian Water, 2024) throughout the region. They also made sure that the projects were communicated in a positive way to convey a positive water future and build trust in the project to solve future drought issues in the region. Therefore, these community projects are mainly carried out in close spatial proximity to the current building sites.

(2) The digital technologies employed create new digital spaces—physically residing in data centers located around the globe—in which the

monitoring and decision-making processes take place (Data Centers World Map, 2025). The vast amounts of data collected are stored in *the cloud*. This allows remote and *real-time* access to the data (Mackenzie, 1997, 2007).[4] However, cloud computing relies on infrastructures such as data centers, cables, as well as energy and water infrastructure and so much more. Wiig (2013, p. 22) demonstrates that while "[T]he last leg of the infrastructural support is wireless and immaterial [...] the rest of the system exists as distinct spaces of network equipment embedded within the landscape." The material infrastructure of the cloud is located in spaces with distinct characteristics which provide "particular political, historical, and geographical conditions"; these include, for instance, energy, a suitable climate, water, fiber optic connections, tax breaks, and security (Pickren, 2018, p. 231). The need for vast amounts of energy and water clearly illustrates the extractive and resource-intensive nature of the data industry and highlights that "computing and data are far from *virtual* and immaterial" (Pickren, 2018, p. 236).

This material dimension of cloud infrastructures is often forgotten as the resulting environmental impacts are spatially distanced from the location of the end-user and the resource "flows hidden at the point of consumption" (Monserrate, 2022, pp. 3–4; Pickren, 2018, pp. 226, 236). Thus, the digital infrastructure is largely invisible, and this invisibility is central to normalizing or *black-boxing* the sociotechnical system (Pickren, 2018, p. 229). Black-boxing is defined by Hinchliffe (1996, p. 665) as a "(temporary) stability, so much so that the controversies surrounding their adoption have to a large extent been erased." The connection between invisibility and normalization is particularly true for digital technologies as their algorithms and codes operate behind the screens while the material domain is masked by intangible metaphors such as *the cloud* (Pickren, 2018, p. 229). Therefore, digital infrastructures like other infrastructures play a crucial role in shaping possible futures through path-dependencies (Jackson et al., 2007; Pickren, 2018, pp. 229–230). Turnbull et al. (2022, p. 10) argue that examining digital technologies through a *material lens* allows for the inclusion of the immense material

[4] Mackenzie (1997, 2007) considered "real-time" as a temporal condition that is fabricated, as computational operations take time to process the data. This "machine time" can be divided into "seek time, run time, read time, access time, available time, real time, polynomial time, time division, time slicing, time sharing, time complexity, write time, processor time, hold time, execution time, compilation time, and cycle time" (Mackenzie, 2007, pp. 89–90). See also Kitchin (2017) on the realtimeness of smart cities.

infrastructures of digital devices, providing the material basis for digitization, and unveiling the extractive economies they rely on (Kuntsman & Rattle, 2019). As a consequence, "… the promise of digital technologies for environmentally-positive futures is debatable" (Turnbull et al., 2022, pp. 10). This shows, for instance, that the SPA project should not only consider the local effects but also the global effects that are hidden behind the screens and sensors and make the digital twin model possible in the first place.

This becomes even clearer when targeting water use in data centers to cool the server racks more efficiently and reduce the carbon footprint in comparison to air cooling (Monserrate, 2022, pp. 9–10). Needless to say, global climate change increases the average global temperature and also the uncertainty about water resources. In response to the growing awareness of data center impact on water-scarce communities like Mesa and Bluffdale in the Western United States, companies like Google have promised to become "water positive by 2030" and "replenish 120 percent"[5] of the water used in their facilities and offices (Brandt, 2021; Monserrate, 2022, p. 10).

Yet, the water consumption of data centers does not align well with the SPA vision that digital technologies are introduced to "combat the risk of shortages, boosting resilience and securing water supplies" as the focus is only on their own supply region (Anglian Water, 2024). However, the consequences for communities and water bodies close to data centers are not accounted for. This creates a spatial divide between the location where the data is sourced (UK) and where it is processed (data center). This divide is only bridged through the virtual space, which connects those places through the digital infrastructure. However, due to the volatile nature of *the cloud*, the SPA team doesn't know where in the world their data is stored and processed, as the data infrastructure is provided by Microsoft's cloud-based software Azure (Costain, 2021). This further detaches the environmental and spatial implications of the data center sites, where the virtual spaces for monitoring, augmenting, and analyzing water availability in the East of England are located, from the region itself.

[5] According to Googles Chief Sustainability Officer Kate Brand (2021), this is achieved by "enhancing our stewardship of water resources across Google office campuses and data centers, replenishing our water use and improving watershed health and ecosystems in water-stressed communities; sharing technology and tools that help everyone predict, prevent and recover from water stress."

8 Conclusion

This chapter discussed the spatial implications of the Strategic Pipeline Alliance Project in the East of England. The SPA envisions a drought-secure future achieved through the implementation of digital water technologies as part of their new water infrastructure—a 330 km pipeline transporting water through the region (Anglian Water Services, 2025). Based on the discourse analysis around the topic of digital water, technological solutionism and sociotechnical imaginaries were identified as the two main lines of argument (Walter, 2024). These are also visible in the SPA project. Solutionist thinking is noticeable as the pipeline project is conveyed as the solution to address the looming threats of future drought in the East of England, while sociotechnical imaginaries of the future are illustrated through the implementation of digital technologies such as the digital twin, which aims to secure the region's water supply by transferring water from areas of surplus to those with shortages. Thus, the application of digital technologies as seen through the SPA promotes visions of a drought-free future and has implications for the production of space. The vision conveyed by the SPA creates new hybrid spaces between the physical and digital. Visions and projections of the (near) future are understood as a necessity within the project as potential water shortages need to be known in advance to enable water transport along the pipeline. So, imaginaries and projections of the (near) future are seen as essential to prevent drought conditions in the East of England.

Future visions and technological solutionism in the SPA project become spatially manifest through the establishment of new water infrastructures and virtually, through the creation of digital spaces. The SPA project is envisioned as the spine of the region. While the pipeline itself will be completely underground after construction is finished, the pumping stations will be visible, both spatially fixing this vision of a water-secure future which is achieved through digital technologies—like the digital twin which is intended to "provid[e] real-time data to drive insight[s], helping […] to monitor and optimise the Anglian Water network" (Anglian Water, 2022, p. 13). To ensure that the vision of a water-secure future also reaches the residents and to build trust in Anglian Water as a reliable water provider in the future, community projects are carried out near current construction sites. Due to the digital technologies involved, new digital spaces are created which also have distinct spatial impacts (e.g., water and energy consumption). These digital spaces reside around the globe, existing in data centers and operating through codes and algorithms. As these digital spaces created for monitoring and data analysis also rely on material infrastructures with consequences for physical spaces, the SPA project should not only be considered regarding its local effects, but in terms of externalized spatial effects caused by the digital processes in the data centers. The pipeline and the digital twin are currently under construction, and at the same time, the visions of a water-secure future are established in space. The new relations forming between physical and virtual spaces, as well as among diverse stakeholders, will only manifest once the project is finished. Thus, further investigation of the spatial consequences emerging in the physical as well as the digital space is needed in the future.

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References

Adloff, F., & Neckel, S. (2019). Futures of sustainability as modernization, transformation, and control: A conceptual framework. *Sustainability Science, 14*, 1015–1125.

Anand, N. (2017). *Hydraulic City: Water and the infrastructure of citizenship in Mumbai*. Duke University Press.

Anglian Water. (2022). *Anglian Water's five-point plan for innovation acceleration. How we're dressing tomorrow's challenges today.*

Anglian Water. (2023a). *Our strategic pipelines*. Anglian Water. Retrieved September 6, 2023, from https://www.anglianwater.co.uk/about-us/our-strategies-and-plans/new-water-pipelines/

Anglian Water. (2023b). *Strategic Pipeline Alliance*. Anglian Water. Retrieved September 6, 2023, from https://www.anglianwater.co.uk/environment/investing-in-the-future-of-water/strategic-pipeline-alliance/

Anglian Water. (2023c). *Huge new water main network opens new pipelaying front*. Anglian Water. Retrieved September 6, 2023, from https://www.anglianwater.co.uk/news/pipelaying-has-started-on-another-section-of-anglian-waters-huge-new-multi-million-pound-water-main-network/

Anglian Water. (2024). *Our strategic pipelines*. Retrieved September 18, 2024, from https://www.anglianwater.co.uk/corporate/strategies-and-plans/new-water-pipelines/

Anglian Water Services. (2025). *Strategic Pipeline Linkedin update*. Retrieved April 2, 2025, from https://www.linkedin.com/posts/anglianwater_our-strategic-pipeline-activity-7310598938766499842-DT63?utm_source=share&utm_medium=member_desktop&rcm=ACoAAEFZfggBKlAXV9CHn-5uWeVnRBuxtUgT-Io

Appel, H., Anand, N., & Gupta, A. (2018). Introduction: Temporality, politics, and the promise of infrastructure. In N. Anand, A. Gupta, & H. Appel (Eds.), *The promise of Infrastructure* (1st ed., pp. 1–38). Duke University Press.

Ash, J., Kitchin, R., & Leszczynski, A. (2016). Digital turn, digital geographies? *Progress in Human Geography, 42*(1), 25–43. https://doi.org/10.1177/0309132516664800

Beckert, J. (2016). *Imagined futures: Fictional expectations and capitalist dynamics*. Harvard University Press.

Björkman, L. (2018). The engineer and the plumber: Mediating Mumbai's conflicting infrastructural imaginaries. *International Journal of Urban and Regional Research, 42*(2), 276–294.

Brandt K. (2021). *Our commitment to water stewardship*. Google. https://blog.google/outreach-initiatives/sustainability/replenishing-water/

Carse, A., & Lewis, J. A. (2017). Toward a political ecology of infrastructure standards: Or, how to think about ships, waterways, sediment, and communities together. *Environment and Planning A, 49*(1), 9–28.

Chambers, S. (2021, July 7) work on massive water pipeline from north to east begins. *East Anglian Daily Times*. https://www.eadt.co.uk/news/21276642.work-massive-water-pipeline-north-east-begins/

Costain. (2021). *Strategic Pipeline Alliance, digital twin project*. Retrieved April 8, 2025, from https://www.costain.com/insights/2021/strategic-pipeline-alliance-digital-twin-project/

Cousins, J. J. (2019). Malleable infrastructures: Crisis and the engineering of political ecologies in Southern California. *Environment and Planning E: Nature and Space, 3*(3), 927–949. https://doi.org/10.1177/2514848619893208

Coutard, O., Hanley, R. E., & Zimmerman, R. (2005). Network systems revisited: The confounding nature of universal systems. In O. Coutard, R. E. Hanley, & R. Zimmerman (Eds.), *Sustaining urban networks: The social diffusion of large technical systems* (pp. 1–12). Routledge.

Data Centers World Map. (2025). World Map of Data Centers. Retrieved April 8, 2025, from https://map.datacente.rs

Delanty, G. (2021). Futures of sustainability: Perspectives on social imaginaries and social transformation. A comment on frank Adloff and Sighard Neckel's research program. *Social Science Information, 60*(2), 285–294. https://doi.org/10.1177/0539018421999562

Dickel, S. (2021). Der „Technological Fix". Zur Kritik einer kritischen Semantik. In SONA-Netzwerk Soziologie der Nachhaltigkeit (Ed.), *Soziologie der Nachhaltigkeit* (pp. 271–284). Transcript.

Edwards, P., Jackson, S., Bowker, G., & Williams, R. (2009). Introduction: An agenda for infrastructure studies. *Journal of the Association for Information Systems, 10*(5), 364–374.

Ekers, M., & Prudham, S. (2017). The metabolism of socioecological fixes: Capital switching, spatial fixes, and the production of nature. *Annals of the American Association of Geographers, 107*(6), 1370–1388. https://doi.org/10.1080/24694452.2017.1309962

Fouché, R. (2017). Sociotechnological (Re-)configurations. In U. Felt, R. Fouché, C. A. Miller, & L. Smith- Doerr (Eds.), *The handbook of science and technology studies* (4th ed., pp. 495–500). Massachusetts Institute of Technology.

Furlong, K. (2010). Small technologies, big change: Rethinking infrastructure through STS and geography. *Progress in Human Geography, 35*(4), 460–482. https://doi.org/10.1177/0309132510380488

Gregor, G., & Stirland, R. (2019). *BIM4Water case study template. Strategic pipeline Alliance (SPA) pipeline and digital twin—SPA initiation case study (SPA1)*. (version 2.2, 19/2/19). BIM4Water. https://cdn.ymaws.com/www.british-water.co.uk/resource/resmgr/bim4water/case_studies/bim4water_case_study_anglian_1.pdf

Gregory G. (2022, February 25). *Anglian Water's strategic pipeline Alliance (SPA) - the use of GIS in the common data environment for the digital twin*. Digital Twin Hub. Retrieved September 9, 2024, from https://digitaltwinhub.co.uk/anglian-waters-strategic-pipeline-alliance-spa-the-use-of-gis-in-the-common-data-environment-for-the-digital-twin/

Guida, S. (2020, August 7). *AI solutions for the Water sector: Interview with prof. Zoran Kapelan*. International Water Association. Retrieved June 10, 2023, from https://iwa-network.org/ai-solutions-for-the-water-sector-interview-with-prof-zoran-kapelan/

Gupta, A. (2015, September 24). *Suspension. The infrastructure toolbox. Society for cultural anthropology*. Retrieved June 9, 2023, from https://culanth.org/fieldsights/suspension

Hajer, M. A., & Pelzer, P. (2018). 2050—An energetic odyssey: Understanding "techniques of Futuring" in the transition towards renewable energy. *Energy Research & Social Science, 44*, 222–231. https://doi.org/10.1016/j.erss.2018.01.013

Harvey, D. (2001). Globalization and the “spatial fix”. *Geographische Revue, 3*(2), 23–30.
Hinchliffe, S. (1996). Technology, power, and space-the means and ends of geographies of technology. *Environment and Planning D, 14*, 659–682.
Howe, C., Lockrem, J., Appel, H., Hackett, E., Boyer, D., Hall, R., Schneider-Mayerson, M., Pope, A., Gupta, A., Rodwell, E., Ballestero, A., Durbin, T., el-Dahdah, F., Long, E., & Mody, C. (2015). Paradoxical infrastructures: Ruins, retrofit, and risk. *Science, Technology, & Human Values, 41*(3), 547–565.
Jackson, S., Edwards, P., Bowker, G., & Knobel, C. (2007). Understanding infrastructure: History, heuristics and cyberinfrastructure policy. *First Monday, 12*(6). https://doi.org/10.5210/fm.v12i6.1904
Jasanoff, S. (2015). Future imperfect: Science, technology, and the imaginations of modernity. In S. Jasanoff & S. H. Kim (Eds.), *Dreamscapes of modernity: Sociotechnical imaginaries and the fabrication of power* (pp. 1–33). University of Chicago Press.
Jasanoff, S., & Kim, S. H. (2015). *Dreamscapes of modernity: Sociotechnical imaginaries and the fabrication of power*. University of Chicago Press.
Johnston, S. F. (2018). Alvin Weinberg and the promotion of the technological fix. *Technology and Culture, 59*(3), 620–651.
Kanaris S. (2024). *How Anglian Water’s Strategic Pipeline Alliance partners drastically cut cost and carbon*. Retrieved April 8, 2025, from https://www.newcivilengineer.com/in-depth/how-anglian-waters-strategic-pipeline-alliance-partners-drastically-cut-cost-and-carbon-02-05-2024/
Kitchin, R. (2017). The Realtimeness of Smart Cities. *Technoscienzia Italian Journal of Science & Technology Studies, 8*(2), 19–41.
Kitchin, R., & Dodge, M. (2014). *Code/space: Software and everyday life*. MIT Press.
Konrad, K., van Lente, H., Groves, C., & Selin, C. (2017). Performing and governing the future in science and technology. In U. Felt, R. Fouché, C. A. Miller, & L. Smith-Doerr (Eds.), *The handbook of science and technology studies* (4th ed., pp. 465–494). Massachusetts Institute of Technology.
Krznaric, R. (2019, March 19). *Why we need to reinvent democracy for the long-term*. BBC. https://www.bbc.com/future/article/20190318-can-we-reinvent-democracy-for-the-long-term
Kuntsman, A., & Rattle I. (2019). Towards a paradigmatic shift in sustainability studies: A systematic review of peer reviewed literature and future agenda setting to consider environmental (un)sustainability of digital communication. *Environmental Communication, 13*(5), 567–581. https://www.researchgate.net/deref/https://doi.org/10.1080/17524032.2019.1596144?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIn19

Larkin, B. (2018). Promising forms: The political aesthetics of infrastructure. In N. Anand, A. Gupta, & H. Appel (Eds.), *The promise of infrastructure* (pp. 175–222). Duke University Press.

Lyons, G. (2011). Technology fix versus behaviour change. In M. Grieco & J. Urry (Eds.), *Mobilities: New perspectives on transport and society* (pp. 159–177). Ashgate.

Maciej, G. (2024). Human–place–technology relations in the digital placemaking process. *Geoforum, 149*, 103950. https://doi.org/10.1016/j.geoforum.2024.103950

Mackenzie, A. (1997). The Mortality of the Virtual Real-Time, Archive and Dead-time in Information Networks. *Convergence: the International Journal of Research into New Media Technologies, 3*(2), 59–71.

Mackenzie, A. (2007). Protocols and the Irreducible Traces of Embodiment: The Viterbi Algorithm and the Mosaic of Machine Time. In R. Hassan, & R. Purser (Eds.), *24/7: Time and Temporality in the Network Society*. (pp. 89–107). Stanford University Press.

Mann, G. (2020, June 29). *Anglian Water forms new strategic pipeline alliance*. Smart Water magazine. https://smartwatermagazine.com/blogs/graham-mann/anglian-water-forms-new-strategic-pipeline-alliance

Monserrate, S. G. (2022, Winter). *The cloud is material: On the environmental impacts of computation and data storage*. MIT Case Studies in Social and Ethical Responsibilities of Computing. https://doi.org/10.21428/2c646de5.031d4553

Morozov, E. (2013). *To save everything, Click here. The folly of technological solutions*. PublicAffaris.

Murphy, D. (2012). *The architecture of failure*. Zero Books.

Oomen, J., Hoffman, J., & Hajer, M. A. (2021). Techniques of futuring: On how imagined futures become socially performative. *European Journal of Social Theory*, 1–19. https://doi.org/10.1177/1368431020988826

Pashby, T. (2024). *Anglian Water's 'most important' infrastructure project partly halted until 2027*. Retrieved April 8, 2025, from https://www.newcivilengineer.com/latest/anglian-waters-most-important-infrastructure-project-halted-until-2027-13-11-2024/

Pickren, G. (2018). 'The global assemblage of digital flow': Critical data studies and the infrastructures of computing. *Progress in Human Geography, 42*(2), 225–243. https://doi.org/10.1177/0309132516673241

Picon, A. (2018). Urban infrastructure, imagination and politics: From the networked metropolis to the smart city. *International Journal of Urban and Regional Research, 42*(2), 263–275.

Popartan, L. A., Cortés, À., Garrido-Baserba, M., Verdaguer, M., Poch, M., & Gibert, K. (2022). The digital revolution in the urban Water cycle and its

ethical-political implications: A critical perspective. *Applied Sciences, 12*(5), 2511. https://doi.org/10.3390/app12052511
Rosner, L. (2004). *The technological fix: How people use technology to create and solve problems*. Routledge.
Sadowski, J., & Bendor, R. (2019). Selling smartness: Corporate narratives and the Smart City as a sociotechnical imaginary. *Science, Technology & Human Values, 44*(3), 540–563. https://doi.org/10.1177/0162243918806061
Salguero, F. J. (2021, March 5). *What's next in the digital transformation of the water industry?*. Retrieved December 9, 2023, from https://www.idrica.com/blog/digital-transformation-of-the-water-industry/
Sarni, W. (2020). The future of water is digital. *The Solutions Journal, 11*(2). Retrieved September 12, 2025, from https://thesolutionsjournal.com/future-water-digital/
Svarstad, H., Benjaminsen, T. A., & Overå, R. (2018). Power theories in political ecology. *Journal of Political Ecology, 25*(1), 350–363.
Taylor, M. (2022, February 15) *Anglian Water marks halfway point in new Lincoln to Grantham pipeline and submits planning applications for next stage of work*. LincsOnline. https://www.granthamjournal.co.uk/news/construction-of-major-water-pipeline-reaches-halfway-point-9240238/
Turnbull, J., Searle, A., Hartman Davies, O., Dodsworth, J., Chasseray-Peraldi, P., von Essen, E., & Anderson-Elliott, H. (2022). Digital ecologies: Materialities, encounters, governance. *Progress in Environmental Geography, 2*(1–2), 3–32. https://doi.org/10.1177/27539687221145698
Wagner, P. (2016). *Progress: A reconstruction*. Polity.
Walter, C. (2024). Digital technologies for the future of the water sector? Examining the discourse on digital water. *Geoforum, 148*, 103918. https://doi.org/10.1016/j.geoforum.2023.103918
Wiig, A. (2013). Everyday landmarks of networked urbanism: Cellular antenna sites and the infrastructure of Mobile communication in Philadelphia. *Journal of Urban Technology, 20*(3), 21–37. https://doi.org/10.1080/01446193.2013.823051

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