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Exploring Water Insecurity in England and Wales: The Future is Relational

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Declaration of Authorship

I confirm that the work submitted is my own, except where work which has formed part of jointly authored publications has been included. My contribution and the other authors to this work has been explicitly indicated below. I confirm that appropriate credit has been given within the thesis where reference has been made to the work of others.

This work is presented in the style of an alternative style of doctoral thesis including published material. The following publications comprise the main body of this thesis, with authorship contributions included:

Paper 1: Sylvester, R., Hutchings, P. and Mdee, A., 2023. Defining and acting on water poverty in England and Wales. *Water policy*. 25(5), pp.492-508.

The study protocol was agreed by all three authors. I carried out data collection, analysis, synthesis and all text writing. Paul Hutchings and Anna Mdee contributed to the revisions of paper drafts, particularly regarding the structure and theoretical framing.

Paper 2: Sylvester, R. and Underhill, H., 2024. Freedoms Ebb and Flow: Boaters' Experiences of Water and Sanitation Insecurity on the Inland Waterways of England and Wales. *Water Alternatives*. 17(1), pp.94-120.

The study protocol, authorship, and responsibilities was agreed by both authors at the outset. Interview data collection was shared equally between the two authors. Data analysis was contributed to by Helen Underhill through her auto-ethnographic knowledge. I carried out all formal coding and synthesis of the interview data into the theoretical framework. I wrote up the first draft, and Helen contributed by writing specific sections from her auto-ethnographic positioning. I wrote the majority of the final text, but with Helen's contribution to specific details and arguments.

Paper 3: Sylvester, R., Hutchings, P. and Mdee, A. The Great Stink in the 21st Century? A Political Ecology of Sewage Discharges in England's Waters. Submitted to Ecology and Society [June 2024].

The study protocol was agreed by all three authors. I carried out data collection, analysis, synthesis and all text writing. Paul Hutchings and Anna Mdee contributed to the revisions of paper drafts, particularly regarding the structure and theoretical framing.

Paper 4: Sylvester, R., Hutchings, P. and Mdee, A. 'Why, in order to try and get the river cleaner, do we have to go through all this?' Searching for New Water Justice in Knaresborough. In preparation.

The study protocol was agreed by all three authors. I carried out data collection, analysis, synthesis and all text writing. Paul Hutchings and Anna Mdee contributed to the revisions of paper drafts, particularly regarding the structure and theoretical framing.

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I have learnt and grown so much during my PhD, but I am ready to close this chapter. I acknowledge the places I've lived and the times I've lived through while doing this research, and I am so proud of my achievements.

Abstract

Water insecurity is not often associated with England and Wales, a place infamous for its abundant rainfall. Existing research is limited and technocratic, naturalising water insecurity as an issue created solely by climate and population shifts. There is a striking gap in critical research, which is needed to re-politicise water insecurity in this context.

Social experiences are the focus of my exploration, alongside hidden political processes which I follow across three distinct studies. I start with a rigorous literature review on water poverty, which I frame as a socioeconomic form of water insecurity. I find that it is much more prevalent than widely acknowledged, and that financial governance structures increase the burden of debt on vulnerable households.

This review raises questions about how people who are not customers of water companies (i.e. those not living in conventional households) access water. This is the subject of my second study, which investigates the lived experiences of canal boat dwellers, and how they access water supplies. I use Sen's capability approach to conceptualise the linkages between water resources and a flourishing life.

My final study considers the wider environmental aspects of water insecurity, as well as the effects of rapid sewer upgrading on customer bills. I focus on the political ecology of sewage discharges into rivers, and the rise in new water justice activism which emerged in response.

Taken together, these three studies begin to paint a picture of contemporary water insecurity in England and Wales, and open up a number of avenues for further research. My findings contribute to social theories of water and water governance in the Minority World. In the conclusions, I suggest what the future of hydro-social relations may look like in England and Wales, and how recognising the lived experiences of water insecurity can support greater security and justice for all.

Table of Contents

List of Figures

List of Tables

Abbreviations

CA	Capability Approach
CAB	Citizens Advice Bureau
CCW	Consumer Council for Water
CDT	Centre for Doctoral Training
CEPA	Cambridge Economic Policy Associates
CR	Creative Research
CRT	Canal and River Trust
CSO	Combined Sewer Overflow
DEFRA	Department for Environment, Food & Rural Affairs
DP	Dwelling Paradox
EA	Environment Agency
EDM	Event Duration Monitoring
E&W	England and Wales
GRT	Gypsy, Roma and Traveller
HIC	High-Income Country
HWI	Household Water Insecurity
IWRM	Integrated Water Resources Management
MP	Member of Parliament
NAG	Nidd Action Group
NEA	National Energy Action
NRW	Natural Resources Wales
NWJM	New Water Justice Movement
PE	Political Ecology
PIC	Public Interest Commitment
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
UK	United Kingdom
UKWIR	United Kingdom Water Industry Research
UN	United Nations
UNICEF	United Nations International Children’s Emergency Fund
US	United States
WaSH	Water, Sanitation and Hygiene
WHO	World Health Organization
WWTP	Wastewater Treatment Plant

Chapter 1

Introduction

1.1 The grainy picture of water insecurity in England & Wales

In the 21st century in England & Wales (E&W), water has widely been considered to exist in abundance and be available to all, due to plentiful rainfall and extensive network coverage. In recent years, public assumptions regarding the high functionality and trustworthiness of water services have begun to break down. New event duration monitoring (EDM) data, beginning in 2021, show millions of hours of sewage discharged into rivers, lakes, and coastline across E&W every year (Dŵr Cymru, 2024; Environment Agency (EA), 2024). The timing of this data becoming publicly available has coalesced with a rise wild swimming, sparked by Covid-19 lockdowns (Deacon and Allan, 2022). Together, these empirical and experiential knowledges have punctured the opaque façade of the water industry, opening it up to an intensity of scrutiny not seen since the 1990s (Marvin and Guy, 1997).

Such intense public scrutiny has focused on the privatised nature water governance. Outspoken activist campaigns are enacting bill boycotts, and the environment regulator is calling for prison sentences for water company executives, in extreme cases (Boycott Water Bills, 2024; Hambly, 2022). Yet the notion that some people experience unsafe, unaffordable, unreliable or insufficient water services is still not widely held, although perhaps it is increasingly conceivable as more questions are asked about how water is being in this context.

While there are several academic fields and disciplines researching water equity and governance, a growing body of research in contexts including the United States and Canada uses the term household water insecurity to refer to the situation of people who lack "*safe, reliable, sufficient, and affordable water for a thriving life*." (Meehan et al. 2020, p.2). More detailed discussion of this body of work is provided in section 2.2. Water insecurity in this case refers to insecure water services for individuals and households, rather than political insecurity in a geographical region. This terminology is rarely used in E&W, yet I argue it is an apt framing for exploring issues of water equity and the social implications of water governance. Below, I briefly overview the existing water insecurity literature in E&W, demonstrating its narrow and technocratic nature.

An early study, from 2002, examines the responsibility for risk and failure in the privatised water industry. Johnson and Handmer (2002) find that risk redistribution occurs when things go wrong, giving the example of water supply insecurity, which water companies can attribute to price caps imposed by the economic regulator. Similarly, Cook (2016) also discusses the complex institutional arrangements in the water sector. She argues that drought planning, particularly

through regulation, has become a proxy measure for water security in this context. Further, Hall et al. (2019) comment that in instances of drought, institutional arrangements enable the system to return to normal functioning after the event. However, they find that the negative impacts on the local economy and environment are not accounted for. Together, these three studies demonstrate the narrow conceptualisation of water insecurity in E&W.

Drought is also a common subject in studies related to water insecurity. Dobson et al. (2020) emphasise the increasing likelihood of droughts, which they attribute to climate and population shifts. Further, Henriques et al. (2015) find river basin management futures to be precarious for similar reasons. Using scenario modelling, they find that short-term economic growth will exacerbate reductions in water quality and quantity. Jenkins et al. (2021) also consider links between drought and economics, examining the impacts of drought on the economy through a risk-based framework.

In this small body of literature, there is little mention of the social nature of water insecurity or the political decisions that affect it. Although regulation is accepted as a driver and measure of water insecurity, there is scant discussion of how regulation is tied to state politics. In general, this body of work is scattered, and does not challenge the existing paradigm under which water is governed. In contrast, in the global literature there are a number of critical perspectives on water insecurity, which do consider governance paradigms and hidden politics.

1.2 Perspectives from critical scholarship

Many critical scholars dispute the assumptions inherent in mainstream definitions of water insecurity. In this section, I outline the key contestations between mainstream and critical perspectives in the global literature.

The term water insecurity first emerged in the 1990s, in the international security and hydro-politics literatures, used to characterise transboundary water conflicts and disputes (Staddon and James, 2014). Early scholars also pointed to increasing risks of water insecurity due to population and climate pressures on water resources (Postel, 2000). In the 2000s, the number of academic articles on water insecurity rose substantially, as did the cross-disciplinary uptake. Cook and Bakker (2012) found that this growing body of research spanned across the physical and natural sciences, engineering, economics, geography, and the social sciences. Recent research and policy often cite United Nations (UN) – Water's definition, which reads:

"*The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters,*

and for preserving ecosystems in a climate of peace and political stability" (United Nations, 2013, np).

This lengthy description is equally vast in scope and vague in detail. Conversely, Zeitoun et al. (2013, p.3) write on the 'battle of ideas' for water security, emphasising that there are "*as many interpretations of 'water security' as there are interests in the global water community*". This idea of competing interests highlights the hidden political nature of this concept. Certain influential organisations (such as UN-Water) and researchers offer singular narratives of naturalised threats to water supplies and resources, based on apolitical drivers such as conflict, population growth, and climate change (Schimpf and Cude, 2020; Wheater and Gober, 2015). Critical scholars from the disciplines of political ecology and economy, contest the naturalisation of these threats, instead arguing that hidden structural processes in fact produce and exacerbate water insecurity.

Political ecology scholars explore how water insecurity language is deployed to serve political narratives and environmental policies in specific contexts. Hussein (2018) analyses common notions of water insufficiency and mismanagement in Jordon, finding that discourse naturalises the reasons for water insecurity blaming climate change, neighbouring countries, and refugees. He also comments that the extensive body of technical research on water scarcity in this context fails to critically examine its politics. Mehta (2001) argues that changing environmental conditions in Gujarat, India are used by those in power to manufacture popular narratives of scarcity and legitimise large dam construction. In her book, she goes on to examine the mainstream global narratives of resource scarcity, also refuting singular narratives of population and climate pressures. She asks: "*Are there alternative viewings of 'scarcity' and better ways to talk about finite resources?*" (Mehta, 2013, p.2)

A recent global collection of research compares different cases of water insecurity, finding that political decision-making and economic structures produce water conflicts through 'state-building, war-making and development' (Selby et al., 2022). They argue that created notions of water insecurity in turn serve to reinforce and legitimise such power processes. Similar political ecology research in E&W is sparse, with a couple of enlightening exceptions. Bakker (2000) writes on the production of water scarcity in Yorkshire in 1995 arguing that, rather than being simply climate-induced, the summer drought was a product of privatised water governance practices and regulations. Walker (2014) similarly attributes growing water scarcity in E&W to water governance, in particular the nature of capitalist exchange and the covert operation of state politics. Overall, political ecology literature clearly demonstrates that water insecurity is far from a natural ecological phenomenon, but rather, it is produced by governance arrangements operating at multiple scales.

Similarly, political economy scholars critically examine water and its distribution. They focus on the economic nature of water resources governance and the supply and demand dynamics of services, also emphasising the production of scarcity **(**Garrick and Hahn, 2021). Zeitoun et al. (2016) critique the concept of calculable risk in water security policy, arguing that it downplays the politics involved in decision-making by focusing on gross domestic product and hydro-climactic factors. Grafton et al. (2019) discuss reform to water governance frameworks to create a more socially and environmentally equitable balance between water supply and demand under increasing pressures. They argue that existing frameworks[1] fail to adequately address equity outcomes and highlight the need to mitigate water reallocation and compensate people who are negatively affected, such as indigenous peoples in Australia.

Other scholars directly critique high-level paradigms, in particular, neoliberal governance models considered by many to be a direct driver of water insecurity. Johnston (2003, p.90) writes that the neoliberal principle of full-cost recovery is "*a recipe for privatization and profit maximization through the commodification of fresh water supplies*." She argues that perceiving water first and foremost as an economic commodity causes disregard for social welfare and environmental protection. Further, Loftus et al. (2019) write on the process of water financialisation, which has developed over recent decades in advanced capitalist economies. Defined as 'profiteering without producing', the financialisation of water resources, infrastructures, and services allows shareholders to accrue capital by borrowing against assured revenue streams of customers – 'captive customers' in the case of E&W[2]. Ahlers and Merme (2016, p.766) call this a "*deeply undemocratic process with potentially highly uneven impacts on social-ecological landscapes*"

Although political economy research on water financialisation does not often explicitly express its relation to water insecurity, it is directly applicable. In E&W, water is privatised to an extent greater than any country in the world, due to the Thatcherite reforms of the 1980s, where the major water companies were listed on the London Stock Exchange. This enabled international shareholders to purchase shares, and companies themselves to be run as profit-making businesses with an increasing prominence of corporate financiers in leadership ranks. As such, the practice of water financialisation has evolved in the corporate levels of the industry to such a high degree, that the security of water resources and services is dependent on the immaterial realm of financial systems of provision (Bayliss et al., 2021; Loftus et al., 2019). Political decisions and economic capacity are determined by those with corporate power in water companies, of which 70% are

[1] Particularly the OECD Water Governance Principles and Integrated Water Resources Management (IWRM). I co-authored a critical paper examining IWRM in Colombia, Ethiopia, India, Malaysia, and the UK (Mdee et al., 2024).

[2] Captive customers are domestic or industrial customers of water utilities who are unable to exercise their consumer rights to switch providers if they are dissatisfied with the service they receive. The absence of this consumer power fundamentally undermines the notion that the water industry operates under 'free market-conditions', despite the claim by Ofwat that it is able to mimic such conditions.

foreign investors (Strang, 2016). This is coupled with the continued (although hidden) involvement of the state, which became re-configured upon water privatisation, but remains key to upholding this governance model (Bakker, 2003; Walker, 2014; Bayliss et al., 2024).

Overall, political economy and ecology scholarship offer invaluable critiques of mainstream notions of water insecurity, so often conceptualised as an apolitical condition deriving from conflict, population growth, and climate pressures. From this perspective, it is clear that many dimensions of water insecurity have not yet been explored in E&W. Water insecurity discourse in this context is narrow, focusing on technocratic approaches to drought prevention and risk-based planning. The financialisation literature establishes a critical view of water governance in this context, but there remains much to be explored, particularly in the realms of lived experiences, social equity, and political ecology.

1.3 Rationale, aim, and contribution

The rationale of my research is, therefore, that by applying a critical perspective to water insecurity I will draw out previously unexplored dimensions in my research context. Critical perspectives often focus on top-down processes and politics, and my objective is to complement this with investigation of different local experience. Such experiences can also reveal hidden political dynamics from the bottom-up.

Below, table 1 sets out the overarching aim, objective and research questions of my research. Some of the language and theories behind my research questions have not yet been covered in this chapter but are discussed in detail in chapter 2. I conducted three distinct studies for my doctoral research and produced four papers (or results chapters). This is because the third study was very large and I decided to split the write up into two papers (chapters). Table 2 on page 7 sets this out in more detail.

Table 1: Overarching thesis aim, objectives and research questions.

Thesis Aim To explore water insecurity in England & Wales by applying a critical perspective and with a view to outlining its hydro-social dimensions.
Thesis Objective Investigate the diverse social experiences and politics of water insecurity in England & Wales.
Thesis Research Questions (a) What are the ways water insecurity is socially experienced in E&W? (b) What political processes and institutional narratives produce and obscure water insecurity? (c) How do individuals and place-based groups challenge top-down water insecurity narratives, and shape new ones based on hydro-social knowledge? (d) What are the theoretical implications for understanding contemporary and future hydro-social relations in E&W?

Research question (a) asks about the different ways water insecurity is experienced. This is the starting point of my exploration, given the gap of social research in this context. The findings from this question contribute to a deeper understanding of water-human (hydro-social) relations in this context, as well as the hidden processes that produce and obscure insecurity. To explore question (b), I also carry out some complementary top-down analyses of policy and institutional narratives. Throughout my research I iteratively 'zoom in' on social experiences and 'zoom out' to a higher view of water governance. Question (c) addresses the individual and collective challenges which are put to top-down narratives of water insecurity, a question that takes (a) and (b) a step further and comes out mostly strongly in my later studies.

I bring together all the findings from my work in chapter 8, where these questions are answered directly. Research question (d) pertains to the theoretical implications, which are explicitly set out in chapter 9. Synthesising complementary findings from social experiences, political processes, and institutional narratives paints a formative picture of what a critical water insecurity might look like in this context. An important part of this is the frame of hydro-social relations, which I go on to detail in chapter 2.

In sum, this thesis explores water insecurity in E&W, taking a critical perspective based on that of global political ecologists and economists. Existing water scholarship in E&W supports my research rationale, in particular the financialisation literature (Bayliss, 2016; Lobina and Hall, 2000; Loftus et al. 2019) and the seminal work of Karen Bakker (2000; 2003). Individually, my three doctoral studies make specific contributions to the literature, outlined in their dedicated chapters and table 2 below. Together, the body of research in this thesis makes a novel

contribution to the water security literature, by evidencing its different dimensions and extending its theorisation in E&W.

1.4 Alternative style thesis structure

This thesis is structured in an alternative style, according to the University of Leeds Engineering and Physical Sciences guidelines. As such, it includes published material alongside a written commentary. Chapters 1, 2, and 3 comprise the introductory commentary, establishing the research background, theoretical basis, and methodological approach. Subsequently, the individual studies are positioned as chapters 4, 5, 6 and 7, as detailed in table 2 below. After presenting these studies, chapter 8 discusses this body of work as a whole, answering the first three overarching research questions. Chapter 9 summarises the theoretical implications of my research, answering question four. Lastly, the bibliography comprises the references for chapters 1, 2, 3, 8 and 9. The paper references are included in their dedicated chapters.

Table 2: Summary of individual doctoral studies, their specific contribution, associated papers and publication status.

Study number and topic	Contribution	Position in thesis structure
Study 1: Rigorous literature review on water poverty.	Synthesises knowledge on water poverty, analysing it from a critical perspective, and revealing hidden structural processes.	Paper 1 (Published April 2023) *Presented in chapter 4*
Study 2: Ethnographic research on access to water and sanitation services with canal boat dwellers.	Documents the lived experiences of an excluded (non-customer) group, who are positioned at a greater risk of water insecurity. The capability approach is used to theorise how services contribute to or restrict wellbeing.	Paper 2 (Published Jan 2024) *Presented in chapter 5*
Study 3: Ethnographic and political ecology research on sewage discharges into Yorkshire rivers and local response.	This study is split into two papers. The first presents an analysis of the regional problem of sewage discharges in Yorkshire. The second approaches sewage as an issue of water justice in the small town of Knaresborough, Yorkshire.	Paper 3 (Submitted June 2024) *Presented in chapter 6* Paper 4 (In preparation) *Presented in chapter 7*

Chapter 2

Theoretical Basis

The previous chapter introduces water insecurity, discussing its definitions and contestations in critical global discourse. It overviews the existing literature in E&W, showing that water insecurity is approached in a technocratic and apolitical manner. As such, the rationale for my research is that, by applying a critical perspective, I will explore novel dimensions of water insecurity in this context. This second chapter discusses the specific topics and theory in my thesis in further detail.

2.1 The modern water paradigm in England & Wales

Applying a critical perspective requires interrogating the paradigm through which water is governed and viewed in E&W. A seminal, critical theory on the governance of water in the Minority World[3] is Linton's (2010) theory of modern water, which conceptualises the institutional, political, and social nature of water. In this section, I set out the key tenants of this theory and consider how they are applicable to E&W.

The modern water theory posits that once water is removed from its physical context through abstraction, it becomes conceptualised as uniform within governance regimes and the public consciousness. Linton (2010) attributes the emergence of modern water to when water supplies were scaled up to the point of becoming industrialised, as this marked a shift in thinking about water – to becoming quantified in terms of meeting population demand[4]. This change re-configured the social dimensions of water to those of supply, demand, and productive use, with water being abstracted from its physical and social context (Linton and Budds, 2014).

In the modern 'west'[5], Linton (2010) theorises that the removal of context has caused water to become thought of as simply H_2O particles, creating the dominant idea of water today as an

[3] Marjory and Minority world terminology is alternative to commonly used Global North and South, or High-, Middle- and Low-Income country terminology. I employ this language, coined by Shahidul Alam, as it "*brings to sharp attention to the anomaly that the Group of 8 countries—whose decisions affect majority of the world's peoples—represent a tiny fraction of humankind.*" (Alum, 2008, p.89). However, there is also longstanding debate on the use of dichotomous language to define global power and location differentials (Khan et al. 2022). As such, Majority and Minority world terminology is not perfect, and throughout my research I endeavour to use regional or local terms to describe the places being referred to.

[4] In E&W, this shift took place in the 1500s, as set out by Hassan (1985), and detailed in section 6.3.1.

[5] Linton (2010, p.6) caveats theorising about water in 'the west' by expressing – "*To speak of Western thought is to invoke a wide variety of (often completely opposite) ideas and ways of seeing; in fact, it is impossible to characterize Western thought as a whole.*" He goes on to explain that he is, rather, theorising about predominant ideas and ways of thinking about water in this broad place and time.

economic good with the purpose of productive use. This has consequences for how it is governed, thought about, and related to across different contexts. Meehan et al. (2020) develop this point further by proposing several 'myths' that are produced by the paradigm of modern water, specifically, that water is universally distributed by trusted providers, with minimal discrepancies in access, affordability, reliability, quality, and quantity. A number of these myths are resonant in E&W.

E&W is indeed considered part of the Minority World, a term which denotes where the minority of the global population resides but where the majority of wealth and political power is concentrated. Both seminal works make the assumption that, in general, countries in the Minority World are characterised by "*extensive network coverage and advanced technological capacities*" (Linton, 2010; Meehan et al., 2020, p.2). This is an interesting assumption to interrogate. For instance, in E&W there is extensive network coverage and yet certain groups are not connected to the mains networks, and many of these are rendered invisible to governance regimes as they do not reside in conventional households. Further, the sprawling nature and age of water infrastructure is part of the reason for high leakage levels and a lack of full network mapping by water companies (Plimmer, 2024).

Therefore, these myths have nuanced expressions in this context. However, the myths of universal access, affordable, reliable services of sufficient quantity are indeed widespread in E&W. This is despite the prevalence of water poverty and the exclusion of people who are not water company customers. While these realities go widely unacknowledged, water insecurity issues affecting more vocal groups are causing the myths of trusted providers and high-quality services to break down. This has come about largely through the issue of sewage discharges into the environment, which became widely known in 2021 and has ruptured the previously strong general trust in water providers. This mistrust is also causing other myths to be challenged. For example, after an incident of drinking water contamination in the south west, there has been an increase in misinformation online (Hutt, 2024).

Linton (2010) theorises that these kinds of technological and social 'water crises' are in fact crises of the modern water paradigm itself. He argues that in recent decades governance regimes underpinned by the notion of modern water have become increasingly untenable, highlighted by the paradoxical nature of water in global policy[6], being simultaneously presented as an economic good, a public good, and a state-owned resource. I suggest that in E&W water governance has been built on many principles of modern water, leading to a form of *modern* water insecurity,

[6] Such as the 1992 Dublin Principles and the UN's Agenda 21.

which is widely obscured. The following section defines water insecurity in E&W and outlines some of the consequences of modern water.

2.2. Defining modern water insecurity

As well as a governance paradigm, modern water is also a social theory. The abstraction of water from its social and physical context affects social connections to water, and many people in E&W are separated from knowing it beyond the tap. Yet water is inherently a hydro-social entity, as theorised by Linton and Budds (2014), shown below in figure 1. The hydro-social cycle conceptualises how the substance H_2O continuously interacts with infrastructures and society to produce what we know to be water. Under modem water, this cycle is well-hidden, obscuring the social and political power relations embedded in it.

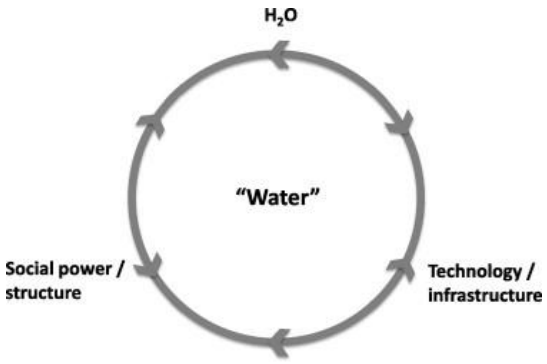

Figure 1: The hydro-social cycle (Linton and Budds, 2014).

Linton's (2010) modern water and the hydro-social cycle (Linton and Budds, 2014) underpin theory on household water insecurity. In this thesis, my use of the water insecurity concept is closely based on household water insecurity, defined by Meehan et al (2020, p.2) as "*a lack of safe, reliable, sufficient, and affordable water for a thriving life*." Household water insecurity in the Minority World is an area that has recently gained a substantial body of literature, both nascent theory development (Jepson et al. 2017a; Jepson et al. 2017b; Meehan et al. 2020) and primary research (Deitz and Meehan, 2019; Jepson and Vandewalle, 2016). The flagship output from this body of work is the development of a quantitative scale by which to measure household water insecurity, based on participant reporting of water acquisition, use and storage, experiences of water insecurity, household food insecurity, and perceived stress (Young et al. 2019).

I base my definition of water security on household water insecurity, given its focus on social experiences of insecurity rather than insecurity in a geographical region, yet I do not use the qualifying term 'household' because I do not confine my research to households only. I also

include people living in unconventional homes, which is an important aspect of water theory development in E&W because private water governance renders non-household consumers invisible. Further, there is an admitted lack of consideration of ecological dimensions in the household water insecurity literature (Jepson et al. 2017a), which is an aspect I sought to include in my work.

As such, I use only water insecurity, although 'modern water insecurity' is perhaps a more precise term. I suggest modern water insecurity is any type of water-related insecurity that exists within a context where modern water governance is prevalent. This includes a lack of assured water access at the household level and the individual level (considering intra-household dynamics and people living in unconventional homes), a lack of accessible public water services (such as free public toilets and water fountains), rendering water in the natural environment insecure (such as through polluting activities and unsustainable extraction), and insecurity in water governance regimes particularly resulting from a lack of citizen participation.

I was not able to explore all these issues in depth in my research, but I reflected on the connections between them throughout, often finding that lived experiences were an important point of entry to other dimensions of water insecurity. Therefore, the definition of water insecurity in this thesis is: **the lack of safe, reliable, sufficient, and affordable water for individual human flourishing and collective equity among and within wider groups of humans and non-humans.**

2.3 Modern water insecurity, poverty and injustice

The household water insecurity literature originated in Majority World contexts (Young et al. 2019), but research based the Minority World began to emerge in the late 2000s, mostly pertaining to Northern America (Doria, 2006; Hobson et al., 2007). During the 2010s, household water insecurity research was published on: vulnerability characteristics and demographics in the US (Deitz and Meehan, 2019; Jepson and Vandewalle, 2016); psychosocial distress (Gaber et al., 2021); bottled water use deriving from water provider mistrust in Australia and New Zealand (Ragusa and Crampton, 2016); European water policies in Estonia and Lithuania (Orru and Rothstein, 2015) and excluded groups such as Roma people, those experiencing homelessness, and indigenous groups (Daigle, 2018; DeMyers et al., 2017; Filčák et al., 2018; Hanrahan and Mercer, 2019).

In the 2020s, this field is gaining recognition, particularly as reviews are produced and theories develop. Meehan et al.'s (2020) review has been highly influential, receiving many citations and

unlocking streams of funding for further work[7]. They note that research in Europe remains sparse. Although there is minimal social research on water insecurity in E&W, there are associated literatures under different framings, namely water poverty and water justice scholarship. Both fields are closely related to water insecurity, as they examine water equity issues, yet with some clear distinctions deriving from different theoretical roots.

Water poverty literature in the Minority World is primarily concerned with the economic dimensions of water access for conventional households. It has an established literature dating back to the 1990s (Marvin and Guy, 1997), which combines the perspectives of water pricing (Bakker, 2001; Huby and Anthony 1997), wider economic poverty (Sawkins and Dickie, 2005) and social exclusion (Lister 1995). Water poverty falls within my definition of water insecurity, as a sub-set of this concept, focused on the affordability of water services for conventional households. I suggest the term socioeconomic water insecurity demonstrates this.

I include social in this description because scholarship has shown that water poverty it is not only an economic condition, measuring when the bill to income ratio becomes too high, but also an embodied, relational state. Longhurst and Hargreaves (2019, p.8) discuss the emotional nature of utility poverty, finding that there is a need to "*explore how emotional engagements are distributed within and across households, as well as across formal policy and support agencies*". They argue that lived experience needs to compliment technocratic approaches. Yoon et al. (2020) find that water poverty is also emotional in nature, but further note that it often represents wider material deprivation in their context of Barcelona.

In Scotland, Anderson et al. (2023, p.8) find that "*water poverty manifests as the inability to afford safe drinking water and unequal barriers and burdens to access it. Thus, water poverty is not merely a financial state but something that is experienced.*" This demonstrates that, although fairly recent in academic literature, the notion that water poverty is emotional, embodied, and experienced is increasingly agreed upon. Scholars such as Anderson et al (2023) write on water poverty and situate it in the concept of water justice.

Water justice derives from environmental justice scholarship, a tradition based on the premise that environmental degradation is distributed in an unequal manner, and further marginalises groups already on the economic or political margins (McLean, 2007). Schlosberg (2004) argues that issues such as cultural identity and democratic rights should be included in understandings of justice. In recent water justice literature, both distributional and recognitional justice are integrated into definitions (Sultana 2018). Zwarteveen and Boelens (2014, p.143) write "*Water*

[7] Katie Meehan received European Research Council funding for 5 years on expanding her US work on 'plumbing poverty' to Europe (Kings College London, 2023).

justice includes but transcends questions of distribution to include those of cultural recognition and political participation, and is intimately linked to the integrity of ecosystems."

The scope of water justice is broader than that of water insecurity as I define it, as it includes the concepts of distribution and recognition. As such, water insecurity can be situated as a manifestation of water injustice in a given context. Anderson et al. (2023) similarly argue this to be the case for water poverty in Scotland. Figure 2 below sets out how I consider water justice, insecurity and poverty to be related to one another.

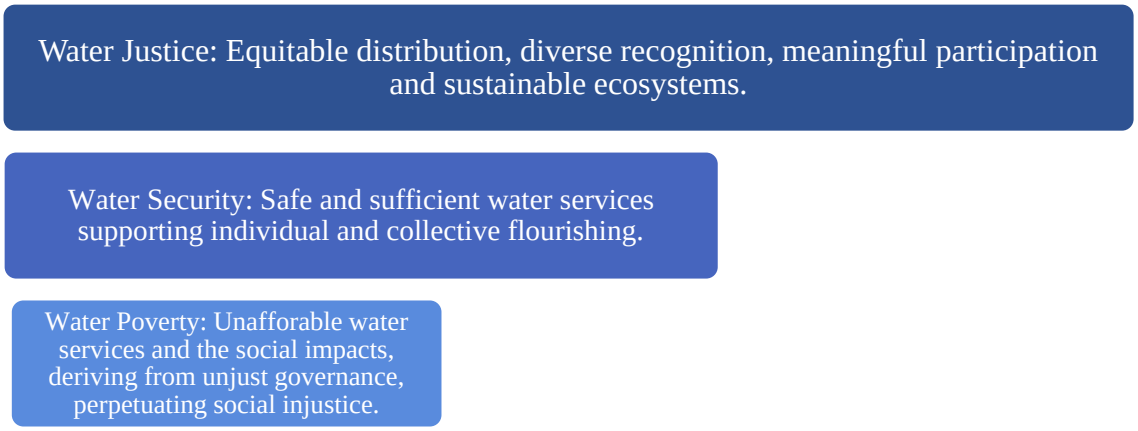

Figure 2: Relationship between water justice, insecurity, and poverty in my research. The gaps on the second and third row represent space for other derivative concepts.

2.4 Living in the dwelling paradox

In E&W, water poverty for conventional households has an established body of literature, whereas insecurity for those living in unconventional homes is a significant gap. Meehan et al. (2022, p.2) coined the term the dwelling paradox (DP) to describe populations; "*for whom no fixed or stable 'home' means no piped water. We call this the 'dwelling paradox' of the human right to water and sanitation.*" The DP pertains to the Minority World, and takes a particular form in E&W. Due to the privatised governance model, most people are configured as household customers of a water company. People living without a conventional home or fixed abode are therefore excluded from customer status, the physical water and sewerage connections that come with it, and the consumer rights.

In their research, Meehan et al. (2022; 2023) focus on people experiencing homelessness and the struggles they face accessing sufficient water and sanitation. Yet, the DP also aptly represents the situation of a number of different groups in E&W who are not counted as household customers. These include: Gypsy, Roma and Traveller (GRT) groups, people who are incarcerated, people

experiencing homelessness, canal boat dwellers, van dwellers, and other people living remotely or off-grid. While the DP presents a clear overarching conceptualisation of how members of these groups are positioned in relation to water insecurity, there are also nuances within and between them, affecting individual experiences of water insecurity. In particular, there is a range of personal agency regarding to what extent people actively chose to live in the aforementioned ways, and whether they consider themselves to be made insecure or whether they take ownership over the condition.

One theory which can support nuanced research with people living in the DP, is Amartya Sen's seminal capability approach (CA)[8], which is built on philosophical ideas of human wellbeing and personal freedom (Sen, 1979; 1985). Establishing the circumstances in which groups are excluded from conventional access to services is an important step in recognising hidden expressions of water insecurity. I suggest that a subsequent step in this largely unchartered area is conducting bottom-up research which considers the political existence of many of these groups. For example, John (2022) discusses the traditions of different GRT people, including those who are itinerant, explaining how cleanliness practices are central to cultural traditions. However, encouraging people from this group to become household customers of a water company would not be a desirable way to improve access to water services, as it restricts an itinerant way of life.

One way of thinking about securing people's access to water in ways which enables them to live chosen lifestyles is through a relational lens. This creates space for valuing immaterial aspects such as wellbeing, culture, and personal agency as well as the infrastructural and institutional arrangements necessary for water provision. In this vein, Jepson et al. (2017a) propose the concept of 'relational water security'. They highlight that the mainstream conceptualisation of water security is based on the idea of securing the physical substance of H_2O. They aim to re-orientate this focus on the control of material water and population supply and demand, to the transformation of water-society relations. Jepson et al. (2017a) consider the purpose of transforming these relations to be enabling human flourishing, as defined by Sen's CA.

While the CA is aptly placed to emphasise subjectivity and complexity within the human experience, it has been critiqued for anthropocentrism, the lack of ecological dimensions and non-consequentialist responsibilities (i.e. human responsibilities for an event prior to its occurrence) (Pelenc et al., 2016). Scholars have developed Sen's theory based on these gaps, such as Nussbaum (2011) extending Sen's theory to include animals and Fulfer (2013) suggesting an

[8] The capability approach was established by the economist and philosopher Amartya Sen. It is foundational to many theories of international development, human wellbeing and flourishing. I use it as a theoretical basis in my second study and a detailed definition and description can be found in section 5.3.

extension into the realms of ‘non-sentient’ life. Human flourishing from water, and a relational approach to water security, fundamentally require ecosystem functioning and balance.

2.5 Exploring the ecology of modern water

Under the modern water paradigm, water has been abstracted from its physical, social, and ecological context. The wider ecology of the water cycle is obscured to a large degree by the modern water paradigm, which funnels water through infrastructure into households and discretely removes wastewaters. However, in E&W, part of this discrete system has become visibly disrupted and has sparked discourse about wider water cycles. Sewage discharges from wastewater treatment plants (WWTPs) and particularly via combined sewer overflows (CSOs) have become a topic of high public interest since EDM data has revealed the huge volumes of discharges every year. For example, 1.75 million hours of sewage was recorded to have discharged through CSOs in 2022 (Stallard and Fisher, 2024),

This issue is a threat to water security in many ways, particularly due to its effect on environmental health, public health, and customer billing (which is being affected by rapid sewer upgrading plans). There are some technical studies on the ecological impacts of CSO or WWTP discharges, although impacts vary greatly depending on the specific water environment. Petrie (2021) assesses the how CSOs contribute to emerging contaminants in the environment. They find that they are an impactful source, but that effects are location specific and in general it is an area in need of further research. Kay et al. (2017) published an influential study on CSOs in England, showing the widespread and routine occurrence of pharmaceuticals in sewage discharges, in particular finding that ibuprofen exists an order of magnitude higher in CSO discharge compared to WWTP effluent.

Further, Giakoumis and Voulvoulis (2023) discuss the geography and characteristics of CSOs in England, shown in figure 3 below. Interestingly, the greatest concentrations of CSOs are present in the major northern cities of Manchester, Sheffield, Leeds and Newcastle[9].

[9] There is discussion of regional variations in CSO numbers in chapter 6.

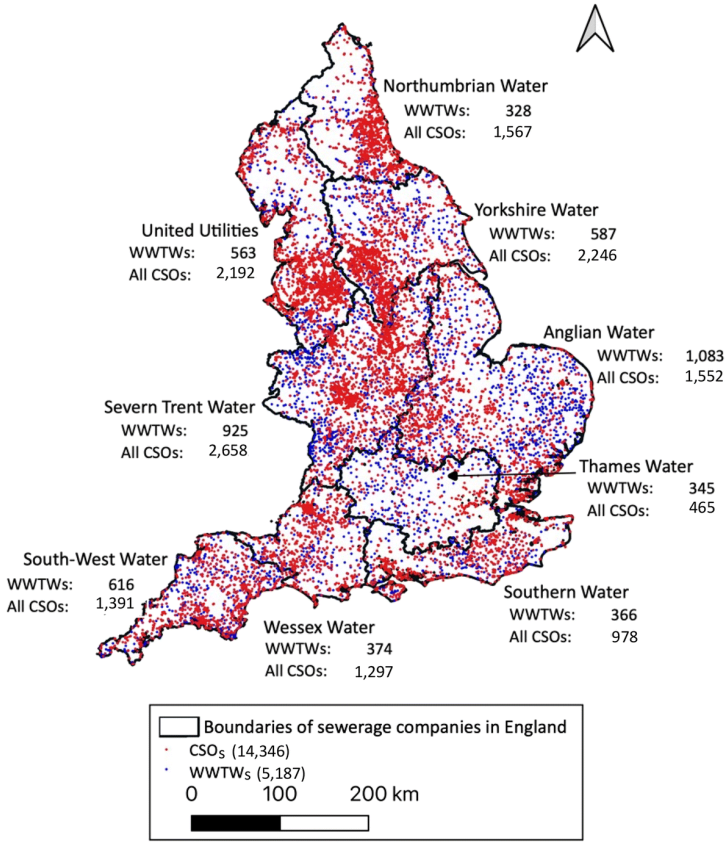

Figure 3: 'Map of locations of WWTPs and CSOs consented to discharge, owned by water companies in England' (Giakoumis and Voulvoulis, 2023).

Perry et al. (2023) comment that CSO spills are increasing due to climate change and increasing water use. They also note some of the social impacts of CSO spills, including: reducing the value of waterside dwellings, additional water processing costs, loss in biodiversity, loss in amenity, and negative effects on tourism. They summarise some of the physical and biological effects of CSO discharges in their graphical abstract, shown below in figure 4. Further, Pretty et al. (2003) examined the environmental costs of freshwater eutrophication, a condition produced in part by CSO and WWTP discharges, finding 'damage costs' combined across sectors sum to £75-114 million per year. This is likely much higher today (given the date of the study). However, it most importantly paints a picture of the scale of water degradation taking place due to sewage inputs into waterways and coastlines.

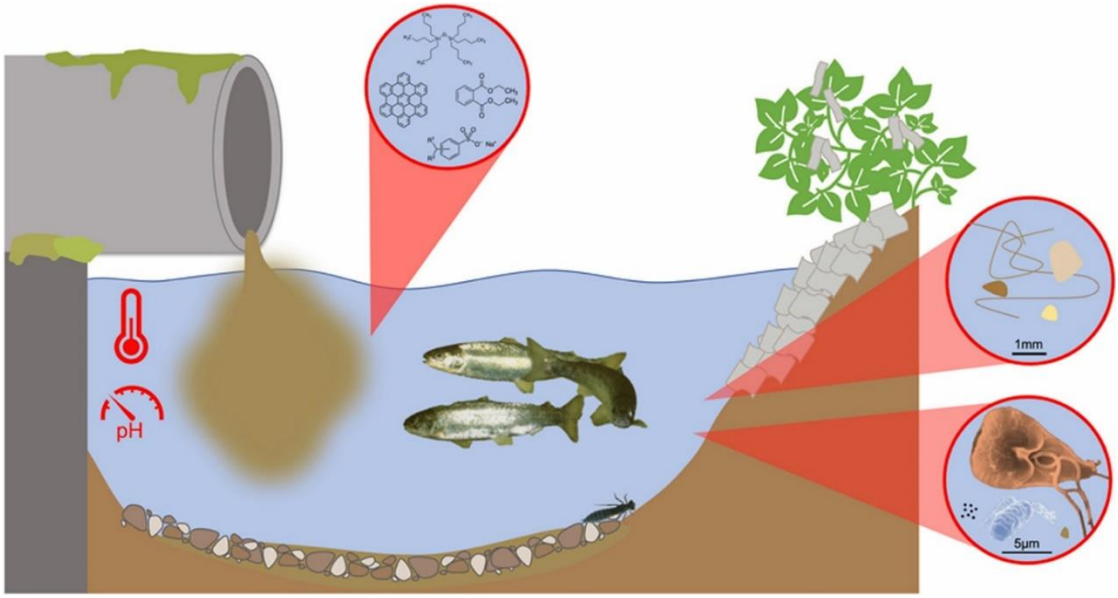

Figure 4: Visual representation of the point of discharge from CSOs and the immediate environmental effects on water temperature, pH, chemical contaminants, fish stocks and microorganisms (Perry et al., 2023).

Therefore, while modern water is premised on removing the contexts associated with water abstraction and wastewater discharges, the impact of sewage in the environment highlights the reality that the context of water cannot be removed. Although hidden for decades, this reality is becoming widely visible. There is no published research in E&W on the social dimensions of this emerging phenomenon. Given the hydro-social nature of water, I suggest that investigating local, social perspectives can help to inform relational concepts of water security in this context.

2.6 Indigenous perspectives on secure water relationships

There is an established scholarship on hydro-social relationships in the anthropology literature. Origins of the philosophical principles of water relationality which inform modern water theories can be found in Indigenous knowledge traditions. This section summarises the work of a number of Indigenous authors, most of whom are from North America, who premise their work on Indigenous philosophies of relationality between humans and more-than-humans[10].

Starblanket and Stark (2018) emphasise how such philosophies can illuminate exploitative practices and offer alternative ways for humans to organise society and govern 'the living earth'.

[10] The critical term 'more-than-human' is used instead of 'non-human' in certain anthropology and geography literatures to emphasise the unique powers and capacities of the non-human world in its own right, separate to the existence of humans.

Many authors take the concept of relationality further than the western[11] literature, emphasising that relationships create and necessitate roles, responsibilities, and protocols which must be followed in order to sustain human and more-than-human life (Chiblow 2023; Sepulveda, 2018; Yazzie and Baldy, 2018). Further, resistance to the dispossession of Indigenous land, rivers, and lakes is presented as a way of acting in relationship with water. Sepulveda (2018) writes that non-Indigenous people can partake in being good relatives, giving the example of assisting in the recovery of colonised and exploited waters.

This literature often re-centres nature in stark contrast to anthropocentric worldviews. Todd (2018, p.74) writes "*the way that we move through this time, through these places that we inhabit, are forever and always shaped by the more-than-human*." Developing this point, Chiblow (2023) highlights that more-than-human life would continue to sustain itself if humans did not exist. In this sense, they emphasise that relationality does not only exist when humans are involved. It is fundamentally a non-anthropogenic theory and must remain so as it becomes brought into western scholarship and practice. Also challenging the centring of humans, Nxumalo (2021, p.4) writes: "*The normalized separation and privileging of certain humans over the more-than-human, also known as anthropocentrism, is intimately linked to ecological precarity and underpinned by racial capitalist colonial conditions*".

Similarly, Yazzie and Baldy (2018) highlight how relational philosophies highlight the need to protect and liberate waters from the exploitive structures of colonialism, capitalism, and patriarchy. Resisting such structures is likewise a goal of Jepson et al.'s (2017a) relational theory, yet it is expressed in a more theoretical way. In their writing, Chiblow (2023) uses the phrasing 'living well' to ground this idea of equitable relating:

"*Living well with N'bi (Water) and Nokomis Giizis (Grandmother Moon) means non-interference of their responsibilities by humans… It is humanity's responsibility to act ethically in relationship with other life forms to ensure continuance of all life's responsibilities."* (Chiblow, 2023, p.289)

These perspectives bring attention to the human and more-than-human beings positioned to receive that most distributional water injustices under global and local power structures, highlighting that relational water security cannot be achieved without rejecting such structures. While this literature is not based in E&W, there are also ancient traditions of water relationships

[11] This is referring to theories such as Jepson et al.'s (2017a) relational water security and Linton and Budds (2014) hydro-social cycle. But I also add a caveat to the definition of 'western' as a heliocentric worldview, as many British people believe and practice their own forms of relationality with waters (Cohen et al. 2023). These practices are western by modern geographies, but are more aligned with Celtic or pagan traditions in the British Isles.

and worship in this context, although these are less prominent in water scholarship. The following section overviews recent literature in this space.

2.7 Treating waters as kin

The idea of kinship with waters concept is similar to the aforementioned Indigenous philosophies of being a good relative, obligating the affordance of care and protection. Seminal anthropologist Veronica Strang asserts that the costs of human societies living in unsustainable ways are borne by other species and environments; an imbalance permitted by anthropocentrism. The concept of kinship she proposes "*aims to conceptualise a more convivial and mutually reciprocal relationship with the non-human domain*." (Strang, 2023a, p.477). Debates are currently taking place regarding how to sustainably govern water in E&W, with some action being taken to replace hard-engineering solutions with nature-based solutions (Andrei and Puiu, 2023). The notion of treating waters as family, or kin, brings a new dimension to such debates.

Strang (2023a) and Cohen et al. (2023) discuss how societal developments over past centuries disrupted continuities between human and more-than-human beings in E&W. Early agricultural development, land enclosure, the industrial revolution, and the emergence of capitalism, increasingly produced and necessitated disciplined workforces upholding hierarchical regimes. These developments were also supported by the Cartesian philosophy of mind-body dualism, separating humans from nature as well as categorising humans into groups (Spencer-Wood, 2016). The process of re-establishing a modern kinship is offered as a way of re-making reciprocal hydro-social relations (Cohen et al., 2023). Echoing Linton (2010), they ask: "*What might modes of relating to, knowing, and valuing water look like in a 21st century that does not destroy the biosphere upon which we all depend*?" (Cohen et al., 2023, p.1880)

While modern water theories consider Minority World contexts to be most disconnected from reciprocal and embodied hydro-social relationships, there are in fact a number of examples of this taking place in E&W. Ancient and modern pagan practices treat waters as living beings, with Strang's extensive work on river deities exemplifying this view (Strang, 2023b). There is also literature on the historic role of holy wells (Foley, 2011; 2013), and research connecting bluespaces and human wellbeing in the present-day, such as through swimming and living by the sea (Denton and Aranda, 2020; Garrett et al., 2019). These studies suggest that many people in E&W are not necessarily deeply disconnected from social relationships with water.

Hydro-social connections and the practice of rituals resonate with Strang's (2023a) conclusion that all humans fundamentally share a similar relationship with water, because of its constant physical properties, sensory experience, and place as essential to life. There is no doubt that

people's relationships with water in E&W have been re-configured through modern water systems, and yet its life-giving properties ensure it remains central to the human experience. This centrality is key to my research exploring different social dimensions of water insecurity, and how relational perspectives can contribute to greater security for all.

2.8 Chapter summary

This chapter details the theoretical basis of critical water security research. The theories of modern water (Linton, 2010) and its myths (Meehan et al., 2020) elicit important insights on the water governance context in E&W. These governance theories are based on the assertion of the social nature of water, in particular the hydro-social cycle (Linton and Budds, 2014). Associated scholars have developed the concept of relational water security to express how securing water (as a social, ecological, and infrastructural entity) requires reciprocal human-nature relationships. Jepson et al.'s (2017a) theory is in its early stages, and they acknowledge the lack of inclusion of environmental priorities. My definition of modern water insecurity as the lack of safe, reliable, sufficient, and affordable water for individual human flourishing and collective equity among and within wider groups of humans and non-humans, is underpinned by this literature.

Subsequently, I overviewed Indigenous and anthropology literature on human-water relationships, which emphasises how duty and responsibility go hand-in-hand with being a good relative or kin. As such, anthropocentrism appears to be at odds with equitable interspecies relations. Recent influential papers have applied these concepts to the UK, emphasising that there are ancient traditions of relationality in this context (Strang, 2023a, 2023b), but that modern water governance has propelled us away from them (Cohen et al., 2023). The challenge (and opportunity) is operationalising relational concepts in E&W for a more equitable and secure future, particularly for marginal human and more-than-human groups.

The following chapter details my overarching methodological approach, as well as discussing the specific methods I use, and my positionality in relation to the research.

Chapter 3

Methodology

The aim of my doctoral research is to explore water insecurity in E&W by applying a critical perspective in this context. In the previous chapter, I discussed the theoretical basis for this exploration detailing how the theory of modern water applies in E&W, how it excludes certain groups from water access, and how it affects hydro-social relationships. In this methodology chapter, I set out my overarching research approach, the influence of transdisciplinarity, the methods used, and my positionality in relation to the research.

3.1 Exploratory research approach

At the outset of my PhD, I was motivated to research social dimensions of water insecurity, with particular interest in the lived experiences of marginal or unserved groups. My Centre for Doctoral Training (CDT) is based in the field of Water, Sanitation and Hygiene (WASH) Engineering, with a focus on global populations, often in the Majority World. I spent the first year of my four-year programme taking master's modules on international development and reflecting on the critical perspectives I was learning about. This process is discussed in more depth in the researcher positionality section 3.4. Briefly, by the end of my first year, I developed my PhD proposal on conducting research on water insecurity in my home context of E&W rather than in a Majority World context.

This choice affected the type of research approach I could take, compared to what would have been possible in other contexts where the social dimensions of water inequity and insecurity have been more extensively researched. The lack of critical research on this topic in E&W necessitated an exploratory approach, drawing from related empirical and theoretical work in other Minority World contexts. Explorative research often focuses on phenomena which have not yet been clearly defined, producing findings in an inductive and reflexive manner (Reiter, 2017; Singh, 2007; Stebbins, 2001). My work has followed an iterative process, with each study developing from the previous, and a constant returning to the theoretical literature as overviewed in the previous chapter (modern water, the dwelling paradox, hydro-social relations). The specific steps involved in this iterative process are detailed in the methods section 3.3.

I chose England and Wales as my setting of focus because, since 1989, they became connected to one another within water governance systems, as the major water and sewerage companies across both countries were listed on the London Stock Exchange. Since then, centralised governance policy and legislation has commonly been applied to E&W as a whole, although there are some

differences, such as environmental regulation being carried out by the Environment Agency (EA) in England, and Natural Resources Wales (NRW) in Wales. In this thesis, the broad research context is E&W, although my third study focuses on England specifically, due to the location of my data collection and the environmental focus which considers the EA but not NRW.

I use a mixture of qualitative methods to gather and co-create knowledge with participants, interlocutors, and a wide range of literature. I consider social knowledge to be co-created rather than discovered, which highlights the importance of researcher positionality and reflexivity, as the researcher is an active participant in the knowledge generating process (Silverman and Marvasti, 2008). I discuss my own position in relation to this work in section 3.4. Although I use mostly social science methods, my work is influenced by a transdisciplinary perspective, as it is considers the engineered water systems as well as with the people who use them and the structures that govern. It is also practice-based, given that the purpose of this work is to support more equitable water governance in E&W, as well as to make a novel academic contribution. The following section provides more detail on the role of transdisciplinarity in my research.

3.2 Transdisciplinary perspective and influence

The phenomenon of water insecurity is multi-dimensional and can be researched through a number of different lenses. Although my work explores its social and political dimensions, my background as a researcher is in the physical sciences, and my affiliated department is the School of Civil Engineering. As such, I bring a transdisciplinary perspective to my research, which seeks to understand better how engineered water systems affect people's lives holistically, and how they are political, in terms of how they are produced and how they operate.

Transdisciplinarity emerged in the 1970s, from critiques of the compartmentalisation of knowledge and the separation of disciplines, with seminal work including Jantsch (1972) and Piaget (1973), and more recently the work of Basarab Nicolescu (Nicolescu, 2002, 2014). Disciplinary separation derived from the Aristotelian logic tradition and has enabled huge knowledge and technological advancements in specific fields. Yet, Max-Neef (2005, p.10) argues that this fragmentation has hindered our ability to perceive an integrated vision of reality, describing the loss of "*other faculties and sentiments that facilitated, so to say, our understanding of Nature from within*".

The term transdisciplinary differs from inter- or multi-disciplinary because it describes a 'transcending' of the boundaries between disciplines. The aim of transdisciplinary research is to understand the present world through the unity of knowledge (Nicolescu, 2014). I find this perspective helpful for enabling an integrated understanding of water insecurity by valuing

different types of knowledges, but also challenging in terms of how to bring these knowledges together.

A part of the benefits and challenges of this perspective is the awareness of different epistemologies. For instance, I find positivism to be a more common way of knowing and thinking about the technical dimensions of water systems, and constructivism or critical realism as a more common way of thinking about the social dimensions. Transdisciplinary values all paradigms equally and seeks to hold space for them all to complement each other and advance holistic theory and knowledge. As such, a transdisciplinary perspective supports both a complex 'way of knowing' water insecurity, as well as a practical way of solving 'real-world' problems (Max-Neef, 2005; Nicolescu, 2014).

3.3 Methods

Detailed explanation of the methods used in each individual study are provided in the dedicated chapters (sections 4.3, 5.4, 6.5, and 7.4). Here, I outline the iterative process of my research, where each study developed from continuously reflecting on the previous study and returning to the theoretical literature.

My first study was a rigorous literature review of grey and academic documentation of water poverty. Through this research, I came to define water poverty as '*the lived condition households experience when they are struggling, or unable, to afford their water bills'* (chapter 4). I employed a systematic-style search strategy and synthesised 354 documents through multiple rounds of analysis, to produce a narrative review following the evolution of water poverty, between 1985 and 2022. Through this study, I found that water poverty can also be framed as a socioeconomic form of water insecurity in this context.

This rigorous and systematic methodology enabled me to overview the majority of publicly available data on water poverty, from which I found some striking gaps. In particular, almost all literature approached the issue from a household perspective. Other than a couple of passing mentions of private water supplies in rural communities, there was no literature on any type of water access beyond that afforded to conventional households. As well as households without mains network connections, this includes people living in 'non-standard' housing, such as those experiencing homelessness, or those living in vans, caravans, or boats. This finding fits in the scope of Meehan et al.'s (2022) work on the dwelling paradox (DP), which theorises how people without conventional living arrangements are positioned at higher risk of water access insecurity.

The DP theory describes the situation of "*unhoused populations, for whom no fixed or stable 'home' means no piped water*" (Meehan et al., 2022, p.2). As such, my second study uses this paradox as a theoretical frame. I developed the rationale for this study exploring the lived experiences of canal boat dwellers or 'boaters', in collaboration with my research partner Dr Helen Underhill. Boaters were chosen as a case study group of people who are not household customers of a water company, and as such are positioned at a greater risk of water insecurity. Helen is an anthropologist who was also a boater herself for six years, and together we developed a research approach that was sensitive to the unique lifestyle and holistic concerns of this group. The type of water insecurity investigated through this study was physical access insecurity.

Another gap identified from my water poverty review contributed to the rationale for my third study. The water poverty literature rarely considered the impacts of water company financial practices on household bills. The only aspect that was considered was the impact of recovering customer debt upon other customers, as per the industry narrative that those in water poverty are a burden to paying customers. Further, by 2022 the topic of sewage discharges had emerged as a pressing example of how water governance financial practices were impacting people and the environment. This presented the opportunity to apply my research rationale to a topic of high public interest. I proposed conducting an ethnographic study on the topic of sewage discharges in Yorkshire, in order to include a range of social knowledge on this contested issue. I also analysed some of the mainstream media and water industry narratives about it. Through this study, I came to frame this type of water insecurity as socio-ecological insecurity.

Overall, my work explored different social and political dimensions of water insecurity through an iterative process, using a mix of qualitative methods. The rationale and theoretical basis for studies two and three derived from knowledge gaps identified by synthesising the large body of literature in study one. As well as exploring different aspects of water insecurity in E&W, my studies build on one another to extend critical water insecurity theory in this context. Below, table 3 outlines the overarching aim, objective and research questions of my thesis, as well as those of each individual study.

Table 3: Overarching thesis aim, objectives and research questions, with individual study aims, objectives and questions.

Thesis Aim To explore water insecurity in England & Wales by applying a critical perspective and with a view to outlining its hydro-social dimensions.					
Thesis Objective Investigate the diverse social experiences and politics of water insecurity in England & Wales.					
Thesis Research Questions a) What are the ways water insecurity is socially experienced in E&W? b) What political processes and institutional narratives produce and obscure water insecurity? c) How do individuals and place-based groups challenge top-down water insecurity narratives, and shape new ones based on hydro-social knowledge? d) What are the theoretical implications for understanding contemporary and future hydro-social relations in E&W?					
Study 1		**Study 2**		**Study 3**	
Aim	To investigate the documented socioeconomic nature and structural drivers of water poverty in E&W.	**Aim**	To explore how access to water and sanitations services on the inland waterways affects the health and wellbeing of canal boat dwellers.	**Aim**	To investigate the perspectives of a range of stakeholders on the issue of sewage discharges into Yorkshire rivers.
Objective	Systematically synthesise existing knowledge on the condition of water poverty, from the period of industry privatisation to the present-day.	**Objective**	Analyse lived experiences around water and sanitation using the Capability Approach to conceptualise the relationship between basic resources and a subjectively 'good life'.	**Objective**	Examine the contested social, political, and technological terrains underlying the emotive public interest in this issue.
Research Questions	1(i) How are the terms water poverty, vulnerability, affordability, and household, defined the water poverty literature? 1(ii) What narratives are produced through the definition and use of this key terminology? 1(iii) How are social experiences of water poverty presented in the literature? 1(iv) What specific structures work to produce water poverty, and in what literatures are these recognised?	**Research Questions**	2(i) What are the ways that boaters access water and sanitation services? 2(ii) Which actors are involved in providing water and sanitation services to boaters? 2(iii) How have narratives of responsibility and blame developed around this issue in boater social groups? 2(iv) What does the provision of water and sanitation services reveal about the political existence of canal boaters?	**Research Questions**	3(i) What are different water stakeholder perspectives on the issue of sewage discharges? 3(ii) How has the increased availability of environmental and sewerage data impacted stakeholder perceptions? 3(iii) How can a political ecology lens situate the contemporary issue in its historical and political contexts? 3(iv) How connected is new water justice activism to embodied encounters with rivers? 3(vi) How is water justice being enacted through existing, place-based social structures and relationships?

3.4 Researcher positionality

My position in relation to this research has been something I have continuously reflected on throughout my PhD. It was also an important factor in my proposal to work on this topic. In this section, I discuss my academic background as well as some of my motivations and reflections on this research.

3.4.1 Motivations and reflections

I joined the Water-WISER CDT at the University of Leeds a year after completing my master's degree in International Water and Sanitation Engineering from Loughborough University. My initial proposal was to conduct social research in the Majority World (with an interest in East Africa, as I had some experience working with non-governmental organisations in Uganda and Tanzania), on the topic of social and gender equity in WASH programming.

During the first year of my PhD, I was fortunate to learn in depth about critical perspectives on gender and development, through taught modules at the University of Leeds and my own personal reading. By the end of the year, I felt like I was not well-placed to conduct this type of research in a Majority World context, and instead decided to research in my home country where I was familiar with the cultural context. Over the last three years, I have had more time to continue to reflect on how it may be possible to conduct ethical research in Majority World settings as a UK-based researcher, however, at the time of submitting my PhD research proposal (September 2021) I felt I was not experienced or equipped enough to do so.

Below, I include a short overview of the field of International WASH Engineering (associated closely with Public Health Engineering). Although this may seem unrelated to my PhD research, it is a significant motivation and ongoing thread in my personal and research identity. It also has many overlaps with the principles of safely managed water and sewerage service provision in E&W.

3.4.2 International WASH engineering

The early origins of WASH Engineering and programming can be attributed to the 1920s, and it has evolved as an academic and practical field over the last century (Venis, 2023). Below, figure 5 shows various modern perspectives from the field, regarding its aim and approach. Some more critical scholarship might contest that an important perspective not included is its historic link to colonisation and modern neo-colonialism (Lue et al., 2023). For example, the green strand below of 'appropriate technologies' is contested by critical scholars regarding whether it has enabled

improved services in places where advanced technologies could not be immediately introduced (Pickford, 1991), or whether it in fact continues to support the provision of sub-standard services (Venis, 2023).

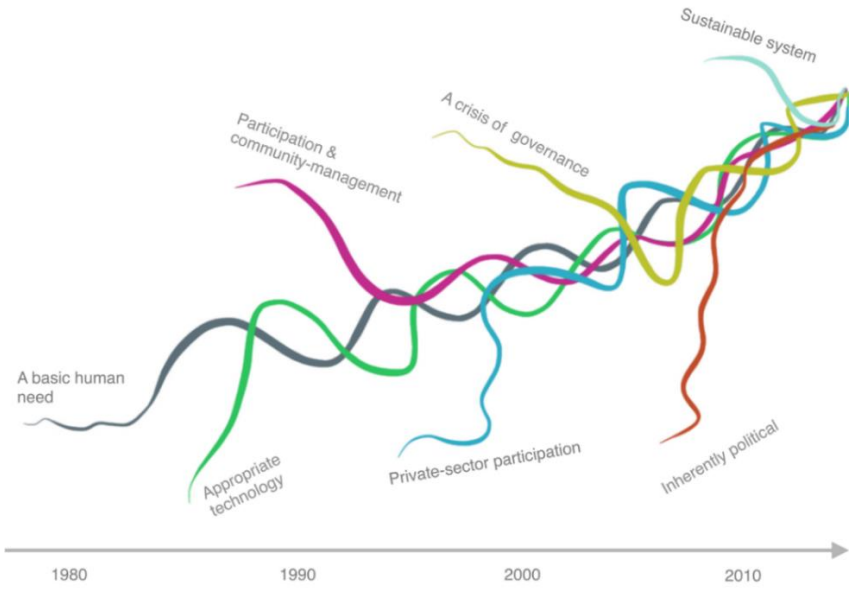

Figure 5: The seven perspectives on sanitation services identified by literature review (Rosenqvist et al., 2016).

For example, a common WASH sentiment is that sewers are not appropriate technologies for many Majority World contexts, and instead a host of alternative sanitation approaches have been trialled and implemented (e.g. container-based sanitation, faecal sludge management, waterless toilets, anaerobic digestion technologies). While there may indeed be contexts where non-sewered sanitation is appropriate (defining appropriate as from the perspective of the people living in that place, not just from an outsider perspective), there are other cases where this appears to be a paternalist, neo-colonial narrative. A leading Kenyan voice in the decolonising WASH space highlighted that the amount of restricted funding that has been put into Nairobi for non-sewered sanitation could instead have been spent developing an extensive sewer network, which is the technology desired by many people living in Nairobi (personal communications with E. Luseka).

In addition, there are clear neo-colonial power imbalances in the global WASH sector, as exemplified by the demographics of WASH leaders. I worked on a joint research project in 2020 which evidences the continued western dominance in global WASH leadership (Worsham et al., 2020). This includes the dynamic of leaders from the Majority World often being trained at universities in the Minority World, since a degree from a renowned institution is often required for entering into leadership roles. Western approaches and worldviews continues to dominate

sector knowledge and practice (Luseka, 2020a; 2020b). A recent publication from a British sector expert reflecting on his long career in rural water supply, recognises that –

"*Although the WASH system at country level indeed needs strengthening and reforming, failure to address deep injustices in the global economic system risks rendering those WASH systems strengthening efforts ineffective.*

Unless and until there is a sufficient groundswell of public and political opinion in the wealthy and powerful nations to identify and address the true underlying causes of the poverty of nations and global inequality, little will change in national sectors such as rural water." (Carter, 2021, p.199).

This is a notable change from the canon of influential WASH texts[12], however it seems there is still a long way to go.

3.4.3 WASH in high-income countries

Since 2020, I have noted increasing interest in the field of 'WASH in high-income countries (HICs)'. At the upcoming University of North Carolina Water and Health conference (an influential annual WASH conference) there is a special collection of research on this topic for the first time. In this way, my work has been timely and has also contributed to this recent momentum through publications, conference presentations, and an upcoming special issue I am co-editing in the Journal of WASH for Development[13].

This is still a small and emerging field, and some studies struggle to find a strong theoretical grounding. Others turn to water theories in the Minority World, like those I discuss in chapter 2. Many of these derive from the Household Water Insecurity Experiences – Research Coordination Network[14], who have theorised in this area for a decade, but are based in mostly non-technical disciplines. I consider this trajectory of WASH researchers turning also to their home contexts to be encouraging and helpful for working to break down the created dichotomy between Global South and North, or Majority and Minority Worlds. Refuting the idea that issues of water inequity only affect people in certain parts of the world is a good first step towards re-politicising WASH.

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[12] Including, Cairncross and Feachem (1983); Halliday and Davey (2007); Pickford (1991)

[13] I am co-editing the issue with my collaborator Dr Helen Underhill from Newcastle University. Papers are currently under review, but the call for papers can be found here – https://iwaponline.com/washdev/pages/si_uncovering_wash_inequities.

[14] The majority of this research group are based in North America. Leading scholars include: Wendy Jepson, Katie Meehan, Leila Harris and Amber Wutich. The group is effective at collaborating, one of the reasons they are gaining influence in the water space. They have a dedicated google scholar page – https://scholar.google.com/citations?hl=en&user=W6VNPmcAAAAJ&view_op=list_works&authuser=2

However, I have found in my work in E&W that research does not simply avoid issues of politics and power disparities by turning the lens on rich countries. Further, researching as an 'outsider' remained the case for me even in my home country. This was most strongly the case in study two, and is discussed in more detail in section 5.4. However, it was also the case during my data collection in study three with activists and water stakeholders in Yorkshire. I reflect on the specifics of this in section 6.5.2. Overall, I have learnt through my research that being critical and reflexive is a continual process, and is relevant in any context.

3.5 Methodology overview

Overall, my rationale for researching water insecurity in E&W is the distinct lack of existing discourse or critical literature on the subject. This gave rise to an exploratory methodological approach, beginning with water poverty as the form of water insecurity with the most documentation, and iteratively developing the subsequent two studies. Novel contributions were made by each individual study, and a wider picture of water insecurity was built by synthesising their collective findings.

Additionally, my personal journey in academia drew me towards researching in my home context. The growing body of work on the topic of WASH in HICs encouraging. To me, it suggests there is some recognition in the field of WASH that engineering problems are inherently political, and that inequities can occur anywhere, regardless of a country's technical capacity or economic status. My work also contributes to this sub-field, although its predominant framing and contribution is in water insecurity theory in E&W and the Minority World more broadly.

Chapter 4

Defining and Acting on Water Poverty in England & Wales

This chapter comprises my first research paper, which is essentially my entire first study. Water poverty was my starting point for exploring the broad topic of water insecurity in E&W, as it is most widely documented form of water insecurity. There is an extensive grey literature, with a large number documents from water companies and Ofwat on the subject. There is also a smaller body of academic literature, starting from 1985, which reveals important characteristics and developments of water poverty over the last few decades.

This rigorous review stands alone in contributing to the water poverty and policy literature. I do not use water insecurity terminology in this paper, as it is not the common framing in this literature. However, in my thesis more widely I consider water poverty to be a socioeconomic form of water insecurity. The majority of literature in this review treats it as an economic condition, although there are some social studies which I emphasise under the sub-heading 'Customer perspectives and experiences' in section 4.4.2. I also emphasise some of the future trajectories of water poverty in section 4.4.3, including mental health and the experiences of vulnerable customers in the 'free market'.

This study opened up avenues for further research on water insecurity, particularly the situation of non-customers who may also be experiencing forms of insecurity but were not recognised in almost any of the literature I reviewed[15]. Below, the paper is presented as published, beginning with the abstract.

4.1 Abstract

Water poverty is the lived condition households experience when they are struggling, or unable, to afford their water bills. Despite a relatively low public profile, it affected approximately 20% of households in England and Wales in 2020. Currently, as many as 34% of bill payers report struggling to pay fairly frequently. This comprehensive review examines definitions, prevalence and manifestations of water poverty through an analysis of 354 grey and academic documents, dating between 1985 and 2022. Synthesising the literature revealed how water poverty is a structurally-produced problem, reflecting trends in sector governance and wider societal processes. In the 1980s and 1990s, water poverty was characterised by household disconnections,

[15] One document did mention households with private water supplies. But none recognised that people living without fixed or conventional abodes would be excluded from domestic customer status.

as defaulting customers were considered a drain on the financial health of newly privatised utilities. Owing to civil society opposition, by 2000 water poverty became a technocratic problem of affordability and debt. Despite certain legal protections for vulnerable households, structural drivers of water poverty were unresolved and rates continued to rise, peaking in 2013/2014. Contemporary discourse emphasises extending availability, accessibility and flexibility of support, but structural inequalities remain hidden. It is, therefore, highly questionable whether the water sector in England and Wales can fulfil its commitment to ending water poverty by 2030.

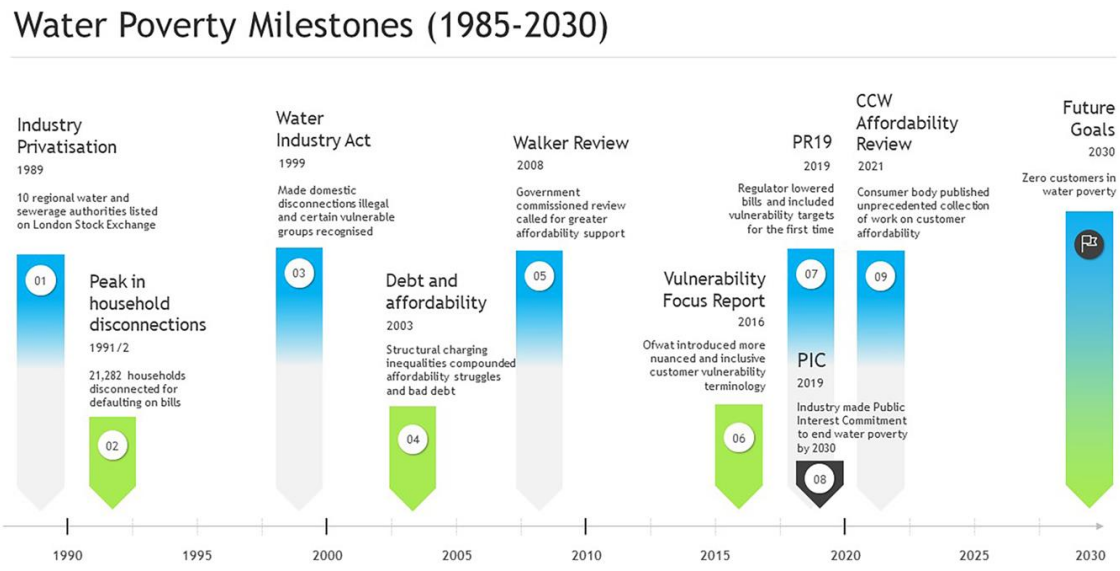

Figure 6: Graphical abstract representing a timeline of the milestone legislation and publications regarding water poverty in E&W.

4.2 Introduction

The UN General Assembly Resolution 62/292 recognises the human right to water and sanitation, holding states and other rights-bearers responsible for ensuring 'safe, clean, accessible and affordable drinking water and sanitation for all' (United Nations (UN) General Assembly, 2010, p.3). It is widely believed that this right has been fulfilled in high-income country (HIC) contexts (Meehan et al., 2020). However, recent research on Household Water Insecurity (HWI) disproves this assumption, finding limitations and inequalities in service provision stemming from a lack of funding and local capacity, discrimination issues and technical challenges (Mattos et al., 2021).

Research in this emerging field is concentrated in the United States. In Europe, water access has been studied largely from an affordability perspective, examining notions of equity within the wider context of population trends and water scarcity (García-Valiñas et al., 2010). Alternative tariff structures, affordability indicators and more targeted support have been proposed to allow

vulnerable households to meet their basic water needs (Martins et al., 2016; Vanhille et al., 2018). Yoon & Saurí (2019) present an ethnographic study centring the experiences of those living with water and energy poverty, asking the question 'who decides the criteria for vulnerability?'

There are a few studies on the affordability of water in the UK, although most were conducted over 10 years ago (Middleton and Saunders, 1997; Sawkins and Dickie, 2005; Chappells and Medd, 2008; Bradshaw and Huby, 2013). No recent academic work has investigated complex affordability issues or, more broadly, perceptions of universal access. Although households in England and Wales (E&W) are protected in legislation from being disconnected from services (Water Industry Act, 1999), assuming that this equates to universal access across the entire population is simplistic. The premise for this review is that water poverty is the most visible case of the infringement upon the right to water and sanitation in E&W, although less visible cases likely exist among transient populations (Anthonj et al., 2020; Maroko et al., 2021).

Water poverty is considered as a 'multidimensional concept open to a variety of definitions' in the European literature (Yoon et al., 2021 p.1330). In E&W, a household 'lives with' water poverty if their water and sewerage bill exceeds 3 or 5% of their disposable income (Consumer Council for Water (CCW), 2021). These affordability thresholds have developed in the literature since the 1990s, deriving from international standards for water affordability (United Nations International Children's Emergency Fund (UNICEF) and World Health Organization (WHO), 2021). The water industry has yet to agree a sector-wide definition, the closest was set out in legislation in 2017:

"*for the purposes of this chapter a person lives in water poverty if the person is a member of a household living on a lower income in a home which:*

– *Cannot be supplied with water at a reasonable cost, or;*

– *Cannot be supplied with sewerage at a reasonable cost"* (Digital Economy Act, 2017)

The terminology in the Digital Economy Act is insufficient for enabling substantive action to be taken. The Northumbrian Water Group and National Energy Action's (NEA) joint programme on ending water poverty by 2030 is currently working on the vital step of establishing a comprehensive definition (National Energy Action (NEA), 2019).

Depending on calculation methodology, between 18–20% and 5–10% of households were affected by water poverty at the 3 and 5% levels, respectively, in the year 2019/20 (Water UK, 2020; Cambridge Economic Policy Associates (CEPA), 2021). In 2022, research found that over a third of customers struggle to afford their bills fairly frequently (Forbes and Kiel, 2022). This

article focuses on the 3 and 5% measures as the standards used in E&W, however studies in other HICs have explored alternative, micro-level indicators for improving the identification of vulnerable households (Vanhille et al., 2018). Martins et al. (2016, p.117) show that average measures alone are insufficient because they can 'mask affordability issues for substantial proportions of the low income groups'.

Statistics reveal the scale of the problem but fail to represent the lived reality. Research has shown the gap between economic indicators and lived experiences of energy poverty, an analogous field with a greater number of studies and progressed theories (Longhurst and Hargreaves, 2019). Focusing on an income percentage frames the problem of energy poverty as a strictly technical one, which can only be addressed through technical solutions. Not only does this 'technicalisation' obscure lived experience, it also hides the political processes that work to create the problem (Middlemiss et al., 2019). Therefore, bringing in social and political perspectives to studying water poverty is necessary to reveal its embodied nature. This is crucial for re-politicising it as a structural problem of inequity and injustice. The last time these perspectives were central to the field of water poverty was during the period of widespread opposition to water company disconnection practices in the 1990s (Huby, 1995; Marvin and Guy, 1997; Middleton and Saunders, 1997).

Investigating the origins of present-day water poverty can reveal its roots, by asking why it exists and how it is produced. Most existing water poverty literature does not interrogate its structural drivers. While economic analyses have calculated the extent of water poverty (Bradshaw and Huby, 2013; NEA, 2019; CEPA, 2020, 2021), the methodologies used do not account for the practice of financialisation. Enacted across the fully privatised water industry in E&W, financialisation is a practice where water companies borrow vast sums from the market by leveraging against assured revenue streams from captive household customers (Loftus et al., 2016; Reis et al. 2024). Such borrowing amounts to shareholder dividends paid out in the billions, yet profits accumulated through financialisation escape regulation as Ofwat (the economic regulator for the water industry) deems them to be market outcomes, which they allow under their mandate of enabling companies to operate as private businesses (Bayliss, 2016). Bayliss (2014a, p.292) argues that financialisation is "*incompatible with social objectives in water delivery*".

Analysing the drivers of water poverty also requires attributing ultimate responsibility for to the state government. Bakker (2005) writes that under privatisation the state does not retreat but is instead re-configured, with the purpose of ensuring the continued functioning of the new governance regime. As such, financialisation is allowed to take place not only by Ofwat, but also by the state which continues to hold the highest responsibility for water services in E&W. Under privatisation, the state sets parameters for the regulatory framework and practically engages with

private business with the explicit goal of increasing private financing (Bayliss, 2014b). People are also re-configured, first and foremost, as customers. Under such configurations, households who cannot pay their bills are incongruous, as non-paying customers are contradictory.

Six drivers of water poverty were recently identified by the water industry research body: 'absolute income, unit cost of water, bill and income volatility, living costs, volume of water required, and customer control and understanding' (United Kingdom Water Industry Research (UKWIR), 2020, p.28). These factors influence the severity of water poverty but do not reveal the structures that produce it. For example, the unit cost of water is set by water companies, varying between regions, as well as between metered and non-metered households (Bakker, 2001). Water billing is not only calculated based on unit cost but also on infrastructural investment, cross-subsidies and the cost of company and customer debt. The role of the customer in paying for these additional costs is not inevitable, rather it is the product of ideologically designed governance processes, which are contested in the academic literature (Bayliss et al., 2021; Hall, 2022). Therefore, political economic drivers of water poverty exist, and are hidden within water sector governance processes.

In this rigorous review, a systematic-style methodology was used to examine the state of scholarly and grey literature on water poverty in E&W. It was synthesised into a chronological narrative, structured around key policy milestones including: the 1999 Water Industry Act; the 2008 Walker Review; the 2021 Consumer Council for Water (CCW) Affordability Review. The first narrative section details the characteristics of water poverty between 1985 and 2000. The influence of privatisation is discussed, particularly changing industry priorities and the new principles behind water charging. The second section presents developments between 2000 and 2022. Marked by the ban on household water and sewerage disconnections in 1999, water poverty in the 21st century is characterised by affordability struggles, social impacts and spiralling levels of bad debt. Section three discusses future trends and goals, highlighting areas that require further research and policy emphasis. Overall, an extensive synthesis of knowledge on water poverty is presented, contributing to theorising its systemic nature and providing insights to support long-term solutions.

4.3 Methods

This study was designed to compile the breadth of published literature on water poverty in E&W between 1985 and 2022. A systematic-style approach was taken to the process of gathering relevant literature, based on the established SPIDER framework (Cooke et al., 2012). Table 4 details the search strategy taken.

Table 4: Literature review search strategy.

SPIDER category	Review strategy
Sample	Population of E&W.
Phenomenon of interest	Water poverty.
Design	Qualitative, quantitative, mixed methods and policy (non-novel research or based on secondary research). Any study design was included if it contained data on water poverty.
Evaluation	Data on water poverty or the associated concepts: affordability, vulnerability, bad debt.
Research type	Academic and non-academic research of any design and nature.

4.3.1 Literature compilation

Databases were selected based on their relevance to the topic of water poverty. Four academic databases were selected because they contain peer-reviewed research from social science, political and economics disciplines. Thirty-five grey databases were selected, comprising water company websites, regulator websites, water sector research bodies, consumer representative bodies, cross-sectoral public support organisations and non-government organisations. The full list of databases searched is included in the supplementary information.

Search terms were developed based on the search strategy outlined in Table 4. These terms are detailed in Table 5. Search strings were formulated by combining terms into strings in sets of three (1 AND 2 AND 3), for example, ‘water consumer’ AND ‘affordabl*’ AND ‘United Kingdom’. In grey database searches, the strings were tailored to the specific database depending on the type of organisation and the effectiveness of the search function. For example, on a water utility website, multiple single-word searches were conducted using terms from key concept 2, because key criteria 1 and 3 were filled by the fact that the website was that of an English or Welsh water utility.

Table 5: Literature review search terms.

Key criteria		Search terms
1	Water consumers	"water user*" OR "water customer*" OR "household water"
2	Affected by water poverty	"affordabl*" OR "water poverty" OR "vulnerab*" OR "water debt" OR "low income household" OR "in arrear*"
3	Relevant to England & Wales	"United Kingdom" OR "England" OR "England and Wales"

Search results were screened to eliminate irrelevant literature by applying inclusion and exclusion criteria to the abstracts and titles. For grey literature without abstracts or executive summaries, the entire text was assessed against the criteria. Figure 7 sets out the process of literature compilation using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach.

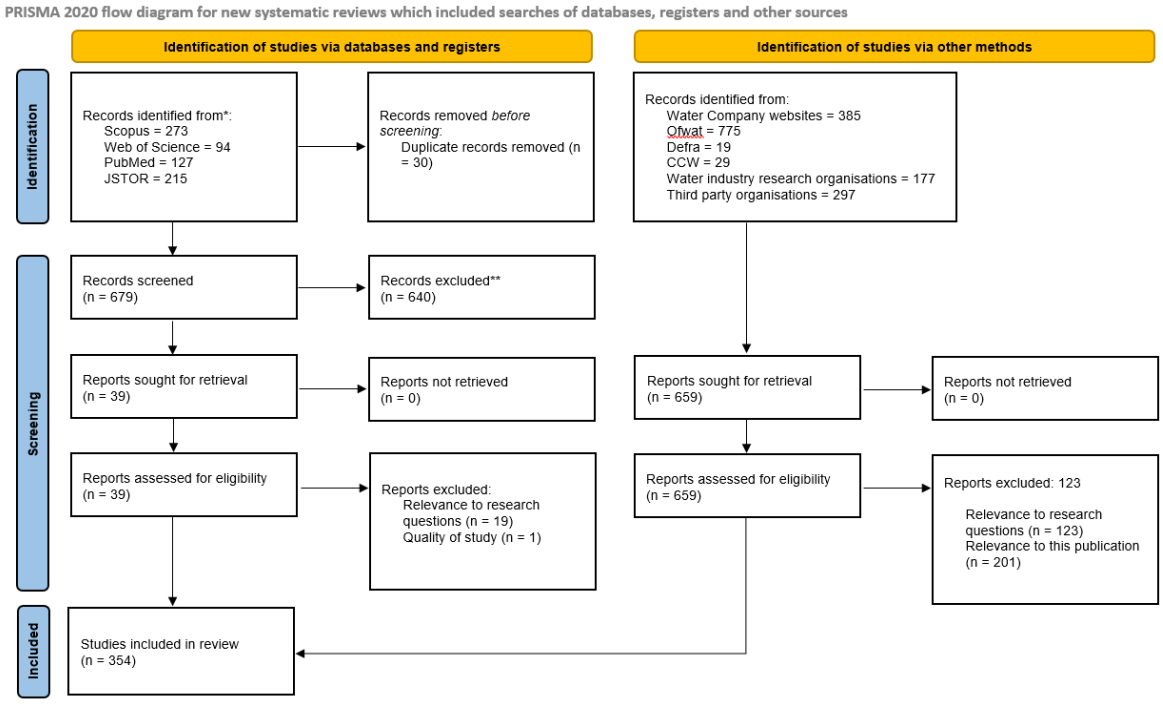

Figure 7: PRISMA flow diagram detailing the literature compilation process.

4.3.2 Quality appraisal

Most of the included literature was non-academic and varied in format and purpose. Therefore, the quality appraisal could not be conducted by ranking literature via a standard quality assessment designed for academic research. A more relevant and impactful indicator in this review was influence, rather than quality. The influence of certain documents or ideas was determined by how often they appeared in the compiled body of literature.

4.3.3 Data extraction and synthesis

The included pieces of literature were downloaded and stored in NVivo software, and subsequently grouped into sets based on the databases they were retrieved from. All documents were read individually, which was done methodically by set. Relevant data were extracted from the document by coding sections of text. Codes were developed based on the search strategy, detailed in Table 1, and some additional sub-codes were generated during reading in an iterative manner. The full list of codes is included in the supplementary information. General notes were also taken to extract additional relevant data.

After data were extracted into codes and notes, they were synthesised through summarising the key points or figures from each section within a code or sub-code. Similar points were grouped together and via an iterative process, a picture emerged of the issue at hand, enabling theory development based on trends and patterns in the data. This process was repeated for the codes based on the key terms water poverty, affordability, vulnerability and bad debt. A historical narrative was built up around chronological policy milestones that emerged out of the data from multiple codes.

4.3.4 Limitations

The main limitation of this method was the number of included documents. Although noticing the repetitive nature of certain information was useful for assessing influence, a similar understanding could have been gained with fewer included documents. The benefits of the systematic-style method, however, included limiting the influence of researcher bias in the inclusion or exclusion of certain literature. A reason for using a systematic-style method was to ensure as much available data on water poverty was compiled. However, this could not be fully achieved due to the number and format of databases. Grey databases could not always be searched using search strings, and so there may have been documents missed. Additionally, some website

search functions did not operate effectively, and at points manual searching through webpages was necessary to locate documents.

The researchers' positionality to the subject matter must also be noted. In terms of replicability, different researchers carrying out the method as described would likely not produce exactly the same results, due to the subjective nature of the data synthesis procedure. However, it is anticipated that the broad themes and conclusions drawn would be very similar, as the influential data and concepts in the literature are undeniable.

4.4 Results

4.4.1 1985–2000: Re-structured water charging

The term water poverty first became widely used in literature and public discourse following privatisation of the water industry. The Conservative government of the 1980s championed neoliberal values and drove the marketisation of many areas of the economy, including essential service sectors. In 1989, the 10 major regional water and sewerage companies in E&W were listed on the London Stock Exchange, and multiple independent and government bodies were subsequently mandated to regulate them. Ofwat, the economic regulator, was tasked with three potentially conflicting responsibilities: protecting the interests of customers, promoting competition, and ensuring the proper financing of company functions (Bayliss et al., 2021).

In the years leading up to privatisation, water companies undertook efforts to get their business assets in order. This led to a new level of scrutiny on domestic customers, in an attempt to recover outstanding debts. Subsequently, the number of household water disconnections rose 40-fold between 1985 and 1989, continuing to increase into the 1990s (Marvin and Guy, 1997). Water poverty at this time was, therefore, characterised by the state that arose from physical disconnection from water and sewerage services.

Water prices increased at a faster rate than any other privatised household utility in the 1990s, with bills rising by approximately 40% after inflation by the end of the decade, hitting low-income households the hardest (Lister, 1995; Bayliss et al., 2021). The gap between the lowest and highest charging areas widened, as the newly private companies set their charging rates based on regional resources and population characteristics, rather than on nationally agreed pricing (Bakker, 2001). Chappells and Medd (2008) argues that this situation was underpinned by the move to economic efficiency principles behind water charging upon privatisation, resulting in households no longer paying an equal rate for the cost of water but instead paying for the cost they imposed on the system.

The term ‘bad debt’ denotes debts incurred by domestic customers defaulting on bills. Between 1989 and 1994, the percentage of households in arrears rose from less than 1 to 9% (Marvin and Guy, 1997). Low household income was found to be a strong indicator of predicting water debt (Huby, 1995; Huby and Anthony, 1997; Bakker, 2001). Another cause of increasing bad debt was changes to the billing system. Upon privatisation, water companies terminated agreements with local councils, through which many households paid their water bills on a weekly basis along with other outgoings such as council tax (Marvin and Guy, 1997; Bakker, 2001). Replacing this system with larger half-yearly bills was, in 1990, predicted by the Department of Social Security to ‘bring about particular problems to income support claimants’, including increasing bad debt and related budgeting problems (Huby, 1995, p.220). Regional disparities were compounded by the fact that means-tested income benefits were set nationally, resulting in some households facing water bills that were twice the price of others as a percentage of income (Huby and Anthony, 1997; Marvin and Guy, 1997; Middleton and Saunders, 1997).

The rising price of water, widening regional inequalities, and changes to the billing system were key factors behind rapidly increasing bad debt in the 1990s. By 1994, two million households were in debt to their water provider, with unpublished figures suggesting this may be a conservative estimate (Marvin and Guy, 1997). This is a notable reference point for narratives around present-day water poverty, as it demonstrates how debt and inequity during this period were strongly related to aspects of water sector governance. Revealing some of the systemic roots of water poverty supports re-attributing responsibility for the condition to the state, rather than individualising it to the households.

Public health concerns

In the early 1990s, rates of diseases including dysentery, hepatitis and shigella reportedly increased, raising national concern about the consequences of water poverty (Marvin and Guy, 1997). Major studies at the time did not find a causal relationship between increased incidents of diseases and household disconnections, with the exception of a small study that discovered unreported health problems in disconnected households, and concluded that such groups were unlikely to be identified by systems due to wider societal inequalities (Middleton and Saunders, 1997). In 1994, the head of the British Medical Association called out water utilities, stating: “*the policy of disconnection [is] inhumane and medically dangerous not just to the individuals but to the wider community*” (Lister, 1995, p.83). Campaigns to end disconnections on public health grounds grew throughout the 1990s. Key campaigners included ‘The Campaign for Water Justice’ lead by working-class women in Bradford and Merseyside, and the Child Poverty Action Group (Lister, 1995).

Increasing civil objection pressured Ofwat to modify their guidance on the practice in 1992, and rates began to fall gradually after peaking at 21,282 that year (Marvin and Guy, 1997; Middleton and Saunders, 1997). The decision to modify the guidance was taken after seven years of high disconnection rates, between 1985 and 1992. In this situation, Ofwat's responsibilities to customers and companies conflicted, and ultimately business interests were prioritised until it became publically unacceptable.

In 1999, after two years in government, the New Labour Party implemented the Water Industry Act which made domestic water and sewerage disconnections illegal. This fundamentally changed the defining characteristic of water poverty in E&W. The reform was timely and necessary, ensuring social protection and a higher standard of living for households vulnerable to water poverty. The following year the concept of vulnerability was officially recognised in legislation under the Water Industry (Charges) (Vulnerable Groups) Regulations, which made provisions for certain groups. To have qualified for support, a household must have been in receipt of an income-related benefit and be either a large family (three or more children under 16) or have special water needs due to a specific medical condition (The Water Industry (Charges) (Vulnerable Groups) Regulations, 1999; Bakker, 2001; Sawkins and Dickie, 2005).

An influential voice on poverty during this decade was Ruth Lister. Applying her knowledge on social inequity to the issue of water, she elicited the complex needs of vulnerable groups, particularly women and ethnic minorities. Lister (1995) discusses the relative size of ethnic minority households compared to white households, in general, making them more vulnerable to high bills under metering. Women tend to absorb the consequences of poverty, for example, they often do the majority of the housework and so become the managers of household water saving when there is scarcity (Lister, 1995). Despite the limitations of the Water Industry (Charges) (Vulnerable Groups) Regulations, they mark the first step towards officially recognising the complexity of water poverty. However, integrating non-financial considerations in an industry now operating in the language of economics was to prove challenging.

4.4.2 2000–2020: Extrinsic reforms

Entering the 21st century, domestic customers were protected from disconnection, enabling them to continue to use running water and functioning sewerage even if they did not pay their bills. Beyond this, no structural reforms were brought in to address the inequalities within the charging system, and consequently, the affordability of bills continued to be a problem for many households (Fitch and Price, 2002; Sawkins and Dickie, 2005). A 2003 report by the Department for Food and Rural Affairs (DEFRA) showed concern that, in the highest charging region, the South West; "*affordability has become a threat to public health… [and] a poor diet and social*

isolation were inevitable if debt is to be avoided and excessive charge absorbed out of a standard pension income" (Sawkins and Dickie, 2005, p.226). The turn of the century marked a new manifestation of water poverty, as an issue of affordability and bad debt rather than physical disconnection. The implementation of the Water Industry Act satisfied opposition sparked by public health concerns, causing political pressure to dissipate.

Regional inequalities in household billing led the UK and Welsh governments to commission an independent investigation in 2008. Known as 'The Walker review', the results from this investigation called for the sector to ensure the affordability of water for those on the lowest incomes, with the final report stating: "*affordability issues must be resolved*" (Department for Environment, Food & Rural Affairs (DEFRA), 2011a, p.4). The Walker review coined the phrase 'affordable for all', now regularly used by Ofwat and other water sector actors (Walker, 2009). In response, the UK government pledged to "*reform the water industry to ensure more efficient use of water and the protection of poorer households*", a commitment later reiterated in 2011 regarding: reforms to the WaterSure tariff; the approach to company social tariffs; and options for government spending to provide further support (DEFRA, 2011a, p. 4).

A key government action precipitated by Walker's investigation was the move to cut South West Water bills by £50 for every household. Although this was not targeted at households in water poverty, it demonstrated that state intervention in the privatised water industry was possible on issues of affordability. However, the wider impact of the review was limited, as recommendations focused on improving the uptake of social tariffs (DEFRA, 2011b), rather than tackling systemic inequalities within the charging system. In a similar way to the ban on disconnections in 1999, the state forced the industry to adjust but failed to ensure complimentary systemic changes. Structural reform in the water industry is not a simple task, as governance processes exist due to the private nature of water companies and bind around funding investments and cross-subsidies through customer billing. Therefore, water poverty and customer affordability are inextricably tied to wider financial engineering mechanisms in the sector (Loftus et al., 2016; Bayliss et al., 2021).

Statistics suggest that the direct impact of the Walker review on customers experiencing water poverty was minimal, as prevalence increased following its publication, peaking in the year 2013/2014. This can be attributed to both the increasing price of water and wider national economic crisis. The price of water rose more than fourfold between 1987 and 2011, a rate faster than inflation and 1.5% faster than earnings (Bradshaw and Huby 2013). Patterson (2013) notes how this crisis led to lower financing costs in the water sector, resulting in companies and their investors making record profits in fallout years while more households struggled to afford their bills. In 2013, a survey by the statutory consumer body for the water industry, the CCW, found

record lows of customer affordability and satisfaction with value for money. Twenty-one percent of customers reported finding their bills unaffordable and 31% were unsatisfied (Ofwat, 2015a).

At PR14, decisions were influenced by the national economic situation, as it would have been unacceptable to continue the trend of increasing prices. Ofwat (2015a, p.21) states that 'Overall, our final determinations for PR14 resulted in water and wastewater bills 5% lower on average in real terms in 2019–20'. As well as setting more consistent prices, greater affordability support was encouraged by the regulator, giving companies the goal of assisting an additional 1 million customers over the 2015–2020 period. In 2015, the number of customers receiving support from their water company stood at 760,000. Therefore, the aim was a total of 1,760,000 by 2020 (Ofwat, 2015a).

During this price review period, the number of customers reporting that their bills were unaffordable remained at around 3 million, the equivalent of 12% of all households (DEFRA, 2017). In 2021, the CCW reported that one in ten, and one in eight customers in England and Wales, respectively, found their bills unaffordable. This equates to approximately 2.5 million households. The reduction of half a million households from the start to end of the 2015–2020 period can largely be attributed to an increase in water company support schemes. In 2019/20, 900,000 households received support (CCW, 2020) which, although an improvement, falls well short of Ofwat's 1,760,000 target (Ofwat, 2015a). Water UK (2020) highlights the 'significant progress' made in the 2010s in the breadth, volume and range of affordability support. However, there remained 2.5 million households finding their bills unaffordable. Additionally, the strategy of funding support schemes through cross-subsidies was not challenged, either on ethical grounds or on the capacity to cover substantial funding gaps. This is further evidence of sectoral resistance to consider much-needed structural reform to governance processes.

Bad debt and funding gaps

Although affordability support and prices have been more favourable for customers since PR14, bad debt in the industry has continued to rise substantially. Table 6 sets out the water industry's cumulative levels of bad debt between 2004 and 2020, along with the impact this has had on average customer bills.

Table 6: Bad debt levels in E&W between 2004 and 2020.

Year	Amount added to average customer bill	Total	Source
2004	Data not available	£785	(UKWIR, 2009)
2008	£11-12	£930 million	(Walker, 2009)
2009	£12	£1.4 billion	(UKWIR, 2010)
2010	£15	£1.9 billion	(DEFRA, 2017)
2013/14	£15 (England) £20 (Wales)	£2.2 billion	(Ofwat, 2013a; 2013b)
2016/17	£21 (England) £32 (Wales)	£2.2 billion	(Ambrose et al., 2016)
2020	£21	*£3.5 billion	(NEA, 2020c)
estimate based on official figures (Ofwat, 2015a)			

The increasing costs associated with bad debt in turn raise the cost of service provision. Stipulations in the privatised governance model require this cost to be absorbed by customers, an arrangement that becomes increasingly socially unacceptable as debt levels increase. As Walker (2009, p.17) explains, "*Both the unrecoverable bad debt and the costs incurred in trying to recover bad debts are added to the bills of those that do pay*." This statement plays into a sector-wide narrative that seeks to emphasise the impact bad debt has on paying customers. Although this is the case, it stems from financial structures that separate company profits from revenue streams that can be used to fund affordability support and recover costs incurred from bad debt.

The calculations performed by water companies to determine the amount added to customer bills are "*calculated by adding the amount of revenue written off, debt operating expenditure, and an assumed 5% cost of capital, and dividing by the number of households billed*" (Ofwat, 2015b, p.8). This can be viewed as a 'vicious cycle', where managing and writing-off bad debt leads to hidden cross-subsidies and rising prices, which heightens problems of affordability. The overall picture revealed by Table 3 is one of rapidly increasing debt. There appears to be no sustainable strategy in the sector for tackling bad debt, other than increasing the amount added to bills. Meanwhile, company shareholders have received a total of £18.9 billion in dividends since 2010 (Hall, 2022).

In 2019, the English water industry made a Public Interest Commitment (PIC), pledging to: 'Make bills affordable as a minimum for all households with water and sewerage bills more than 5% of their disposable income by 2030 and develop a strategy to end water poverty' (Water UK, 2019, p.2). Until 2019, water poverty figures were calculated from the Department for Work and Pension's Family Resources Survey data, and were broadly consistent year on year as shown in table 7. This methodology is attributed to Bradshaw and Huby (2013). Meeting the recent PIC target requires close monitoring, a consideration that led to the revisiting of this established methodology. In 2020 Water UK, the representative body of the water industry as a whole, commissioned an in-depth analysis of water poverty in E&W. The purpose was to establish baseline water poverty levels and explore 'detailed methodological choices', for example, the decision whether or not to include housing costs in disposable income figures (CEPA, 2021; Water UK, 2020). This study used income data from the ONS and billing data supplied by water companies. Self-reporting is also used to verify statistical measurements of affordability, particularly from CCW's 'Water Matters' survey.

Table 7: Water poverty prevalence in E&W between 2007 and 2020.

Year	Households at 3% level	Households at 5% level	Source
2001/2	17%	N/A	(Fitch & Price 2002)
2007/08	22%	10%	(DEFRA, 2013)
2009/10	23.6%	11.5%	(Bradshaw & Huby 2013; NEA 2020a)
2011/12	23%	11%	(DEFRA, 2013)
2013/14	24%	11%	(NEA 2019)
2017/18	21.9%	10%	(NEA 2020b)
2019/20	17.9%	6.5%	(CEPA 2021)
2019/20	>20%	5-10%	(Water UK 2020)

The 'water poverty gap' reflects the theoretical minimum cost of eradicating water poverty, if interventions could be perfectly targeted (CEPA, 2020). The gap was first calculated for the year 2009/2010, showing that households at the 3 and 5% levels required their bills to fall by a mean average of £3.46 and £3.62, respectively (Bradshaw and Huby, 2013). Re-calculation for 2017/18 found these figures had increased to £4.75 and £6.48 (NEA, 2019), despite a reduction in the

prevalence of water poverty, as shown in Table 4. This increase in depth signifies that more financial support was required to lift households out of water poverty, although there were fewer of them overall (NEA, 2019). These results correlate with the total number of households in water debt: 5.5 million in 2013, falling to 3 million in 2020 (Citizens Advice Bureau (CAB), 2020). In 2019/20, the total water poverty gap was found to be £236 million at the 5% level and £720 million at 3% (CEPA, 2020). These figures support a concern shared by many essential service sectors; that support is effective in reaching 'easy win' cases but not those of entrenched poverty. Households with complex cross-sector affordability and debt issues are harder to reach, and numbers of such households are likely to increase along with recent rises in inflation and energy prices.

Customer perspectives and experiences

Ofwat defines affordability as "*the ability of a customer to pay their water bill*" (Ofwat, 2017, p.2). Two qualitative studies commissioned by the CCW investigated what customers consider affordability to mean. Study participants found it difficult to define the concept, seeing it as relative to necessity, cost and time (Creative Research (CR), 2009, 2014). Whether a bill was thought to be affordable depended on its priority against other outgoings and whether a person struggled as a result of paying it (CR, 2009, 2014). Bills that could be paid often and in smaller amounts were considered more affordable (CR, 2014). Therefore, the ability to budget well in the context of all household outgoings had the greatest impact on perceived affordability. This is distinct from income level, although the two are connected.

Water affordability is strongly related to other outgoings, in particular energy and housing, which often cost much more than water and are generally a higher priority for customers. In their small qualitative study, Rosenblatt et al. (2021) used customer research to rank priority outgoings, putting food, housing costs, electricity and gas before water, in agreement with other studies (CR, 2009, 2014). Although the cost of water bills is lower, if customers give priority to larger energy and housing costs then the perceived affordability of water may be reduced. Often low-income customers are on pre-payment meters for gas and electricity, which adds to the pressing need to pay these outgoings first (CR, 2009). Customer affordability is therefore shown to be subjective and circumstantial, demonstrating the limitations of 'top-down' statistics based on water bill to household income ratios.

For customers living with water poverty, common coping behaviours were found to include: cutting back on leisure and social activities, buying only the essentials, and dipping into savings (CR, 2009). Those with the greatest affordability issues would continually trade off essential outgoings and juggle multiple debts. The emotional responses to living in water poverty varied.

Those with children, disabilities or health conditions found it particularly hard to make cutbacks, both emotionally and for health purposes. Overall, "*people disliked being in a situation where they could not pay their bills, often it had come about through a change in circumstances*" (CR, 2009, p.66). CR (2014) found that among participants' fears were 'universally expressed' over consequences of non-payment, such as bailiffs and County Court Judgements. Many respondents expressed dissatisfaction with water bills being addressed to a single named person in the household, because it implied that one person had the power to control all household finances (CR, 2014).

Research has shown that water customer experiences of bad debt are similar to other forms of debt (NEA, 2020a). Customers in arrears reported finding themselves in spirals of debt, with the toll this took on their mental health restricting their ability to get back on track (CR, 2009, 2014). Some used problematic strategies, such as delaying payments and taking out credit cards. Those who did begin to pay back their arrears could not understand why their debt might continue to rise despite regular payments. Many shared a fear that by contacting their water utility regarding arrears they may be penalised in some way, such as through forced meter installation (CR, 2009, 2014). Emotionally, those who were in debt expressed anxiety, fear, helplessness, anger and a sense of isolation (CR, 2014). Overall, the literature shows that water customers in debt "*gained little if any benefit from not paying a bill but rather, this added to the stress they were already under in coping with day to day life*" (CR, 2009, p.66).

4.4.3 2020–2030: Pressing challenges, ambitious targets

By 2020, the literature reveals an improved understanding in the sector of water poverty and affordability issues faced by customers. However, the roots and drivers are contested, and structural solutions are overlooked by most actors. The current decade is one of high pressure for the water industry, with many simultaneous challenges needing to be addressed. The 2019 PIC summarises five priorities to be resolved by 2030; leakage, affordability, net zero, plastic waste and social mobility (Water UK, 2019). The requirements to fund interventions through customer billing is a cross-cutting theme that has been identified as problematic for customer affordability, especially when the cost of living remains at unprecedented levels.

In 2021, the CCW commissioned a review of water affordability, comprising calls for evidence; research into social tariffs; cross-sector best practice; and customer views on affordability support (CCW, 2020, 2021; Cook, 2021). Key developments in the water poverty landscape since the Walker review were summarised in this review, including regional variations in billing and support; institutional funding constraints; overlap between water poverty and other forms of poverty; debt management strategies; and the need for improved relationships between water

companies and the customers and communities they serve. Recommendations to address these issues were made, including a single social tariff across E&W, a sector-wide adoption of the 5% definition of water poverty and proactive engagement with customers utilising new technologies such as data sharing (UKWIR, 2020; CCW, 2021).

If these recommendations are to be actioned, institutional arrangements and funding structures in the water industry are in need of upheaval. Although it falls short of stating this explicitly, this review presents the greatest opportunity for the water sector to enact reform on the problem of water poverty, since the Walker review.

4.5 Discussion

4.5.1 Vulnerability

The introduction of vulnerability terminology in the 1990s enabled policy approaches to begin targeting customer groups which were in greater need of support. Early definitions of vulnerable customers were narrow, and described in Fitch and Price (2002) as 'completely ineffective' as uptake stood at less than 1% of those eligible in 2001/02. In 2014, UKWIR published a list of vulnerability factors, extending those of the 1999 Regulations. These were as follows: living alone; long-term disability or illness; not owning a car; living in social or council housing; single parent; head of household is unemployed or in receipt of benefits; claiming pension tax; and three children under 18 living in the house (UKWIR, 2014).

In the first Vulnerability Focus Report, now a yearly publication, Ofwat (2016, p.20) defined the concept of vulnerability as:

"*A customer who due to personal characteristics, their overall life situation or due to broader market and economic factors, is not having reasonable opportunity to access and receive an inclusive service which may have a detrimental impact on their health, wellbeing or finances*."

This report marked a shift in the use of vulnerability terminology: away from the restrictive approach of focusing on particular demographic groups, to recognising it as a state or set of circumstances. Ofwat (2017) claims that half the population will at one time or another find themselves in a situation that could make them temporarily vulnerable. Practice has changed substantially, with the regulator and water companies employing the new concept of vulnerability to tailor support. However, the statutory definition of vulnerability remains outdated, as the

Citizens Advice Bureau (CAB) highlights, calling for the need to ‘remove that mismatch between rules and reality’ (CAB, 2019, p.10). Only 4% of customers reported receiving financial support in 2021/22 (Worsfold and Saif, 2022), implying that progress has been slow since the 1% figure reported in Fitch and Price (2002).

Mental health and future population trends are two other aspects of vulnerability emerging in current sector discourse. Research has shown that engagement in essential service markets can be difficult for customers experiencing mental health issues, as it requires proactive communication and dealing with potential ‘crises’ such as a missed bill or service outage (Kilshaw et al., 2021; Holkar, 2022). In 2017, Ofwat and Ofgem produced a combined report detailing population trends that are important for the sectors to consider when planning customer support. It detailed physical and mental health, disability, age, and caring trends in the UK, and commented that companies looking to ‘build customer confidence’ must engage with such trends (Ofgem and Ofwat, 2017).

4.5.2 ‘Won't Pay’ customers

Since the 1999 Water Industry Act banned household disconnections, there has been a widespread belief in the water industry that customers in arrears fall into two categories: ‘won't pay’ and ‘can't pay’. It is considered that ‘won't pay’ customers intentionally do not pay their bills because they know they cannot be cut off from services. The evidence suggests that this narrative is a prejudiced version of reality. In 2009, UKWIR, the research platform for UK Water Companies, found household affordability issues to have a strong influence on both debt penetration and intensity, suggesting that the proportion of ‘won't pay’ customers was lower than assumed (UKWIR, 2009). In their research with 42 customers experiencing water poverty, CR (2009, p.69) concluded that “*The assumption that water debt is caused by customers knowing they cannot be disconnected is not supported by this research*”.

In a non-water-specific study on debt in low-income households, the Joseph Rowntree Foundation found that participants felt they could ‘more safely ignore’ water bills if money was not available because they wouldn't be disconnected (Dearden et al., 2010). NEA (2020a) comments that water bills are one of the first that customers default on, evidencing the levels of bad debt in the water sector as more than double that in energy. Additionally, a 2018 Joseph Rowntree Foundation report found that arrears on water bills were the most common type of debt for low-income households (Bayliss et al., 2021).

Although inconclusive, the literature on this issue presents a more rounded picture than the narrative of deliberate or malicious defaulting on bills. Instead, the most common situation appears to be that when customers cannot afford all essential outgoings they often default first on

the one with less immediate consequences (NEA, 2020a). However, many central water actors maintain that certain customers choose not to pay their water bills despite being able to do so. Recent stakeholder research found that respondents from water companies were more likely to hold this view compared with those from other stakeholder groups (Cook, 2021). This implies a disconnect between outward facing language, such as vulnerability terminology, and pervasive internal attitudes.

4.5.3 Collective and non-customer relationships

Recent public discourse has shown that the water sector's relationships with consumers and the environment are under increased scrutiny. Until the 2020s the industry operated discretely, with limited transparency, enabling issues such as spiralling debt being kept low-profile. Many organisations call for water companies to improve communication and relationships with their customers (CCW, 2021). Sustainability First (2020) recognises that outcomes in the water sector do not only occur in the individual customer sphere, but also occur for citizens, communities and the wider public. Public acceptance and community value placed on water resources comprise integral parts of social-water relationships.

There is also a hidden tension between customer and non-customer access, Citizens or residents of E&W who do not reside in standard households do not enjoy protection from service disconnection, for example, those experiencing homelessness, canal boaters, van dwellers, and Gypsy Roma and Traveller communities. The access levels received by such groups are widely unknown in the UK, although some data have been collected in other contexts (Anthonj et al., 2020; Maroko et al., 2021). These studies point to a situation of unstable and unreliable access, as well as uncertainty around which institutional actors are responsible for ensuring all people have basic access to this human right.

Upon privatisation, households in E&W were re-configured first and foremost as water customers. As well as excluding those who do not live in standard households, this also renders households in water poverty incongruous as customers pay for their services by definition. This, consequentially, re-centres the state in discourse on responsibility, as demonstrated in a range of grey literature from the water industry. The state is does not retreat but is re-configured upon privatisation (Bakker, 2005), strategically setting the parameters for regulation and engaging with private business (Bayliss, 2014b). The very existence of water poverty necessitates the state to take on a different role, focused on equitable water pricing (and equitable cost of living, as water poverty is closely related to general poverty).

While the practice of financialisation is absent from water poverty analyses, it is a crucial factor, as water companies continue to leverage loans against the assured revenue raised from captive customers. A question for future research could examine whether companies count the revenue from those in water poverty in their financialisation practices. This is connected to the emphasis from the grey literature that bills defaulted on by those in water poverty must be added onto paying customer bills. Just as bad debt costs accumulate exponentially, so do such levies (shown in table 6), in theory enabling companies to leverage larger loans based on larger customer bills.

4.6 Conclusions

Water poverty as it exists in the present day is the condition in which households struggle to afford their water bill and suffer economically or socially because of it. Emerging as a pressing problem in the 1990s, water poverty worsened substantially during the years of early privatisation as the water industry sought to establish business interests, often at the expense of customers. The 1999 Water Industry Act removed companies' powers to disconnect households from services. However, this did not solve the problem of water poverty, as the root causes of unequal charging structures and affordability issues for vulnerable households were not addressed. Therefore, in the 21st century, water poverty has been expressed as an affordability indicator and is characterised by the debt and wellbeing consequences that arise from falling below this threshold.

Bad debt accumulated to an estimated industry total of £3.5 billion in 2020. This figure continues to spiral as financial mechanisms in the privatised industry require debt costs to be covered through customer billing. Narratives in sector discourse have blamed vulnerable customers for putting pressure on paying customers' bills, and sometimes for deliberate non-payment. This argument has been disputed by research in the 2010s, which has brought to light the more complex reality of holistic household affordability and prioritisation of essential outgoings. Levels and diversity of affordability support have improved during the 21st century. Despite this, evidence suggests that at least 1 million customers in need of support are not receiving it. This figure is based on industry targets rather than actual levels of water poverty, which is still measured by affordability indicators. Support offered varies substantially between companies, often compounding nuanced inequalities related to high charging regions, metering penetration and nationally set income-related benefits.

The majority of water poverty research between 1985 and 2022 has concentrated on high-level economic analyses, water company responses and the situations of vulnerable customers. There is scant investigation into the structural roots of the problem. This review has revealed the complex drivers of water poverty, in both water sector governance processes and wider societal circumstances. While providing immediate support through social tariffs is necessary, reforming

sector governance is required if the problem of water poverty is to be solved in the long term. Overall, it is clear that structural issues including unequal charging systems across regions and between households, bad debt recovery mechanisms, funding gaps in affordability support, and the requirement to finance infrastructural investment through customer billing, are incompatible with the target of ending water poverty by 2030.

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Chapter 5

Freedoms Ebb and Flow: Boaters' Experiences of Water and Sanitation Insecurity on the Inland Waterways of England and Wales

The previous chapter explored water poverty and its evolution over the past four decades. It concluded with implications for the water industry as a whole, and emphasised that the majority of existing research has been conducted from the top-down, using economic approaches. Further research investigating a diversity of social experiences is needed for a clearer picture of water poverty as a socioeconomic condition in this context.

This chapter focuses on a different form of water insecurity, pertaining to physical access insecurity among a group of non-customers who live within the dwelling paradox. These are people who do not live in conventional households and so are not counted as domestic customers of water companies. Therefore, they are positioned at a greater risk of water insecurity as the institutional responsibilities for water service provision are unclear, necessitating some degree of self-provisioning.

This second study came about through partnering with Dr Helen Underhill, who is an anthropologist and canal boater herself. In this paper, we hold together the precarious positioning of boaters as well as the desire of many to live a lifestyle outside of societal norms. This leads to discussion regarding the subjective experiences of living with water insecurity, and the place of unassured access within the historic and modern boating lifestyle.

5.1 Abstract

This article explores how boat dwellers on the inland waterways of England and Wales – 'Boaters' – experience water and sanitation services. Boating populations are not counted as customers of private water utilities, so they exist within the 'dwelling paradox' and are positioned at greater risk of water and sanitation insecurity. Interviews and auto-ethnography document a myriad of ways in which participants use these resources on different vessels and waterways. The Capability Approach emerges as an apt framework for representing nuanced journeys from water and sanitation access to perceived quality of life. Findings suggest that equitable services can be defined as those which enable Boaters to live in ways they value. This entails reckoning with diverse – and potentially divergent – definitions of a 'good life', supported by the personal freedoms to achieve it. We argue this research makes a strong case for centring lived experiences in service design, particularly in instances of disagreement on the constitution of adequate service

levels. Co-creating knowledge with people living in the dwelling paradox reveals complex relationships with authority and exclusion. We extend this theory, and the principles of equitable service delivery, to emphasise the situated desires, choices, and freedoms of the populations in question.

5.2 Introduction

"The people living on the water will find ways to survive. They will make it work. But (…) how good is their wellbeing while they survive?"[16]

Itinerant populations living on the waterways have always adapted their resource use around their lifestyle patterns. Many water points are located in locks, because historically this was the only chance a merchant boat would get to stop briefly and fill up, a design that perplexes many modern Boaters; "*If you don't understand the history of the canals, it doesn't make sense*".[17] Today there are over 35,000 boats on the 2,000 miles of inland waterways managed by the Canal and River Trust (CRT) in England and Wales (E&W) (Canal and River Trust (CRT), 2022), with growing numbers of people moving on board in search of affordable housing[18]. Public attention to canals and rivers as dwelling and leisure spaces is increasing due to rising housing costs and Covid-19 lockdowns, creating pressure on those living on the water. The essential services that enable Boaters to live well are hence more important than ever. This research asks how Boaters today meet their water and sanitation needs and how these services affect their lives more widely. We focus on human diversity, looking at the plurality of Boaters' experiences as a way to explore the issue of water and sanitation insecurity in E&W.

5.2.1 The water industry and the dwelling paradox

In recent years there has been a swell of public interest in the national water industry, following revelations concerning sector profit, drought, and sewage discharge (Buse and Bayliss, 2022). This has propelled disintegration of the belief in 'modern water' – the idea that clean, affordable water is available to everyone via trustworthy systems of provision (Meehan et al., 2020). Although modern water narratives are widespread in high-income countries (HICs) research refutes them, finding stark systemic inequities in areas of the United States, New Zealand, and Australia (Te Aho, 2010; Deitz and Meehan, 2019; Hartwig et al., 2022). These studies support

[16] I1, 18 May 2022
[17] I8, 30 May 2022
[18] This is a particular issue in London; Canal and River Trust figures state that boats without a home mooring on London's waterways numbered 2208 in 2019, up 246% from 638 in 2012 (CRT, 2019: np).

wider theory which argues that active or passive exclusion from water and sanitation services can exist anywhere, regardless of a country's income level (Jepson and Vandewalle, 2016; Sultana and Loftus, 2020; Brown et al., 2023). There remains a dearth of research on service inequity in E&W, despite a systemic context characterised by power disparities. Strang (2016, pp.310) describes national water governance as "*a rather alarming picture of water and power moving away from societies, upwards and outwards to a largely undemocratic, unaccountable and untouchable transnational and potentially 'despotic' regime*".

Political economists have shown that, at the corporate level, the water industry in E&W prioritises profit and 'financial engineering' over the people who rely on services (Loftus et al., 2016; Bayliss, 2017). Thus, we argue that hidden dynamics in governance processes can be revealed by those who use services in alternative ways. Recent literature has brought attention to the situation of unhoused populations. Sylvester et al. (2023) question the institutional responsibilities for providing services to 'non-customer groups', broadly defined as people not living in 'standard' dwellings or living in dwellings with non-standard service connections. Such groups may include boat dwellers; Gypsy, Roma and Traveller (GRT) people; van or caravan dwellers; refugees and displaced persons; those living 'off-grid'; and those experiencing homelessness. How these populations access water and sanitation services in E&W is unregulated and widely unknown[19], and in the case of GRT peoples often intersects with direct political discrimination, as highlighted in John (2022).

Producing theory in this space, Meehan et al. (2022) establish the concept of the 'dwelling paradox' (DP), revealing how those experiencing homelessness are often unable to meet their water and sanitation needs due to lacking a conventional home environment. This theory is detailed in Meehan et al (2023), which argues that the capitalist governance of water and housing is increasingly making water available only through private means, and that those without housing have no choice but to access it in public spaces. As such, "*The dwelling paradox therefore denotes a space of entrapment: no home, no secure water*." (Meehan et al. 2023, p.2).

This theory asserts that such spaces of entrapment are actively produced by states and capitalist institutions in the Global North. Approaching the DP from the bottom up, this study sets out to investigate how such spaces are perceived by some of the people existing within them. Boaters on the inland waterways of E&W are a novel group on which to focus, with the nuances and diversity among them revealing new insights into what the DP means within their lifeworlds and what this says about the concept of equitable service provision.

[19] The campaign group *Friends, Families & Travellers* drew attention to these issues in relation to Covid-19 lockdowns by providing guidance to assist Local Authorities in supporting these populations in March 2020: https://www.gypsy-traveller.org/news/covid-19-guidance-for-supporting-people-living-on-traveller-sites-unauthorised-encampments-and-canal-boats/

Figure 8: Accessing water as an itinerant boat dweller.

Note: Accessing water as an itinerant boat dweller involves navigating to canal-side taps, most of which are provided and maintained by Canal & River Trust, such as this one on the Regent's Canal in Angel, London. On this busy Sunday afternoon there was a queue of three boats waiting to fill their tanks, necessitating a likely wait of over two hours (depending on water pressure, number of boats, and the volume of their tanks).

5.2.2 The contemporary canalscape

The population of focus and sub-groups within it are sometimes referred to as liveaboards, Boaters, or Bargee Travellers, the latter being a term for an ethnic group descended from nomadic working boat families (UK Parliament, 2019). Identification with these labels is complicated by the different ways in which people use their boats for dwelling and leisure, as well as by the demographic diversity that has resulted from more people moving afloat due to rising housing costs, particularly in London (Bowles, 2019). We use the most commonly used emic term, 'Boaters', whilst acknowledging the diverse ethnic backgrounds, livelihoods, and politics among a group that is diverse in terms of gender, age, class, socioeconomic positioning, and occupation.[20]

[20] Additionally, the term Boater is used under the grouping of Traveller in UK government policy making, as part of "a range of ethnic groups or people with nomadic ways of life who are not from a specific ethnicity" (UK Parliament, 2019).

The myriad different ways in which Boaters understand themselves as living 'off-grid' illustrate the kaleidoscope of differences among this group and inform the ways in which they may shift their priorities and make different choices in dynamic circumstances. As this research reveals, this has important implications for their attitudes to service provision and definitions of water and sanitation insecurity.

There is a nascent body of social science literature on Boaters, largely centred on the London waterways and tackling community identity and participation through material practices (Bowles, 2016, 2017, 2019); gendered performances of competence and belonging (Roberts, 2019); and reflections on the housing crisis and the desirability of 'nomadic' mobility (Scovazzi, 2016). Strikingly, in several cases this research was undertaken by anthropologists residing on boats themselves (in addition to Bowles, Roberts, and Scovazzi, see Malkogeorgou, 2019). Research on mobile tourism has examined the different attitudes and practices adopted by boat owners and dwellers versus holiday hirers (Kaaristo, 2018, p.262), revealing 'codes of conduct' around mundane aspects of boat life – toilet, shower, and laundry facilities (Kaaristo, 2018, p.146). Kaaristo and Visentin (2023) consider the presence and absence of water in the inland waterways using affordance theory, in the UK and Italy. Elsewhere, Bowles (2019) has analysed Boaters as an 'alternative' group with a fraught relationship to the navigation authority, the CRT.[21] Bowles (2021, p.29) argues that this "*longstanding series of conflicts with the authority tasked with managing and maintaining the waterways*" informs intra-community relations among Boaters, extending the idea to remark on this antagonistic relationship as a foundational element of the 'community' itself, as "*a large part of what binds them together*".

[21] The Canal and River Trust is a charitable trust which in 2012 took on responsibility for the waterways in England and Wales from its predecessor, British Waterways.

Figure 9: Additions to official signage illustrating diverse Boater frustrations – with each other, and with the CRT – on the Kennet & Avon Canal.

Note: It is generally accepted that each boat should vacate the water point as soon as its tank has been filled.

Community is a contested concept, and one that can cloak dissimilar associations and attachments (Clark, 1973). This is equally the case on the waterways and among Boaters. An important factor in the relationality between Boaters is the reason why they were attracted to the lifestyle. To some, it is its off-grid and alternative nature, whereas to others it is seen as an essential form of affordable housing (Sterrit, 2022). The number of people moving onto boats due to struggling to afford housing on land has grown rapidly over the last twenty years, especially in London (Shepherd, 2016). This has gone alongside housing costs outstripping wages for years, with house prices rising twice as fast since 2000 (Borrett, 2021), and renting prices forecast to grow by almost double that of wages over the next three years (Partington, 2024). More experienced Boaters find that these new types of Boaters put pressure on existing waterways services and often do not know the etiquette or bylaws (Shepherd, 2016). One characteristic of such new Boaters is they do not want to travel, but stay permanently in one area, which 'is not acceptable' according to CRT (Ibid).

Most Boaters' lifestyles are characterised by mobility practised in the contemporary canalscape, historically rooted in the industrial geography of 18th century Britain (Wallace and Wright, 2022). For the purposes of this article, it is important to recognise that relationships with mobility –

mediated through both the physical canal environments and the CRT's regulatory environment – enable or restrict Boaters' freedoms, most obviously in terms of moorings, but also in terms of basic resources. Kaaristo and Rhoden (2017, p.90) discuss both water and toilet facilities as key among the 'mundane' considerations that dictate the mobility of both a boat and its occupants, observing that "*water, therefore, serves as a temporal structuring device both for the mobility of the boat as well as the Boaters on board*". On most of the canal system in E&W, Boaters' access to utilities is wholly mediated by the CRT.[22]

By engaging with these complexities, this paper explores how different types of Boaters meet their basic needs using existing water and sanitation services, including the range of issues they face, the strategies they employ, and analyses the implications for their lives more widely. This produces an extension of the DP theory in a novel context and from the bottom up. Situating it on the inland waterways of E&W provides new insights into how it operates structurally, as well as what this means in reality for people dwelling in the liminal spaces between political resistance, autonomy, and exclusion. This article begins by outlining the use of Sen's Capability Approach (CA) as the analytical framework underpinning our ethnographic research, followed by a methodological reflection centred on the authors' 'insider-outsider' dynamic. Our findings are then described sequentially, taking the theoretical journey of the CA from service availability (resources) to experiences of access (conversion factors) and wider life implications (capabilities). These stages and their components are outlined in figure 10. Conclusions are drawn regarding what equitable services could entail for this distinct population, as well as for other groups who may find themselves confronted with the realities of life within the DP.

5.3 The capability approach: An ethnographic analytical framework

The CA has become foundational in the field of international development as a means of assessing people's health, wellbeing, and overall quality of life (Sen, 1974, 1979, 1985). Integral to this approach is a person's freedom to choose what a 'good life' means and looks like to them. Sen's theory is growing in popularity as an analytical framework for researchers interested in evaluating quality of life and systems change grounded in people's lived experiences (Kimhur, 2020; Van der Boor et al., 2020). Given the ethnographic nature of this study, the experiential emphasis of

[22] This is in spite of the fact that there are dozens of navigation authorities in the UK, significantly including the Environment Agency (responsible for the River Thames, River Medway, and the rivers of East Anglia), the Broads Authority (Norfolk and Suffolk Broads and adjacent waters), and the Canal and River Trust (most canals and some rivers, such as the Severn, Trent, and Ouse). For a map outlining these, please see: https://waterways.org.uk/waterways/using-the-waterways/waterways-directory

the CA made it an appropriate framework for analysing our findings and pinpointing the journey from resource availability to access, use, and wider life impacts.

With the CA framing our study, we were also able to generate broader insights into the field of water and sanitation capabilities research, building on the existing literature. Water as an essential resource for supporting human capabilities is established by Mehta (2014). Jepson et al. (2017a) extend this concept by theorising water security as a network of hydro-social relationships which support or restrict human capabilities. Wutich et al. (2017) support this development, arguing that definitions of household water insecurity should include human rights and capabilities. Sanitation was first conceptualised as an essential resource for human capabilities by Barrington et al. (2017). Later, an empirical study conducted in Maputo, Mozambique assessed sanitation interventions from the perspective of the CA, finding that people's quality of life was affected to different degrees based on their capacities to 'convert' sanitation resources into capabilities (Ross et al., 2021). Most recently, an instrument to measure quality of life as derived from sanitation was proposed by Ross et al. (2022).

We considered this approach an apt framework for analysing themes arising from interviews and auto-ethnography. Although Boaters' experiences varied greatly at the individual level, the impacts of water and sanitation access were far reaching in the lives of all participants. Services enabled or restricted people's wider wellbeing and capacity to live in ways that they desired and valued. During the second round of data analysis, interview transcripts were coded using thematic analysis based on the CA, with the authors seeking to group experiences without losing the individual stories behind them. The use of full quotes and consistent threads of feelings and attitudes were central to this synthesis process.

Capabilities are defined as the 'real opportunities available to a person' or 'freedoms to achieve' (Sen, 1985). Essentially opportunities, and the freedom to take them, allow people to choose how to live and achieve their desired quality of life. Sen did not define specific capabilities, leaving this open to interpretation and to contextual relevance (van der Boor et al., 2020). Nussbaum (2011) has produced the most well-established set of ten core capabilities for human life. We base our analysis on Nussbaum's definitions, discussing the specific effects of access to water and sanitation services on certain capabilities in the last section. This is the culmination of the article, which is arranged in such a way as to guide the reader through the capabilities journey, as illustrated in Figure 10.

5.4 Research methodology

5.4.1 Practice and proximity

This article draws on broader knowledge from an ongoing research project on experiences, rights, responsibilities, and participatory action among Boaters in relation to essential services.[23] This paper is confined in scope to Boaters' lived experiences of water and sanitation, based primarily on semi-structured interviews. In terms of the presence and positioning of 'service providers' (such as the CRT and water and sewerage companies), we limit our present discussion to observations of these actors raised by our interlocutors (chiefly concerning their suspicions that those responsible are deliberately denying or degrading service provision). The complexity of the issue of rights to, and responsibility for, these services forms part of our ongoing research project but falls beyond the scope of this article.

One of the authors has lived on a narrowboat for the past seven years, and the research design was therefore informed by extensive participant observation and auto-ethnographic knowledge. Throughout this paper, we have included images taken during 'fieldboating' (Kaaristo and Visentin, 2023) across the waterways of London and South West England, with descriptive captions reflecting on the experience of accessing essential services as a live-aboard Boater. This serves to holistically illustrate the issues at hand, whilst further reflecting on researcher positionality.

The research team comprised one Boater and one non-Boater, leading to an iterative process of reflecting on this 'insider-outsider' pairing and subsequent perspectives on the research. In the planning and interpretation of the research activities, the insider perspective was prioritised and was crucial for creating research that would be relevant to the Boating population. One aspect of this was the awareness of the growing interest in researching the Boating community and being wary of increasing perceptions of surveillance of or data extraction from participants. Another aspect of this 'insider-outsider' perspective was the dynamics that emerged during interviews. For example, with the non-Boater researcher, participants often assumed no prior knowledge of 'boat life' and so took care to delineate practical and material details of boat systems and daily practices. This resulted in an interview style with more distance between researcher and interviewee, which for the most part seemed positive, enabling people to speak with authority and separation from the interviewer.

The 'insider' researcher adopts an auto-ethnographic approach to their work in order to situate themselves in debates surrounding canals as dwelling spaces – a reflexive analysis which complements participant observation to uncover the situated, embodied, material, practical, and emotional aspects of these issues. With an ongoing commitment to this community of practice

[23] For more information: www.waterdweller.com

and way of life and a desire for Boaters' concerns to have a balanced hearing, they each approached this research with the intention of building relational knowledge *with* Boaters rather than of extracting knowledge or 'data' *from* them. Although reckoning with this embedded status is not without its difficulties (see Scovazzi, 2016, for a thorough discussion of positionality as a Boater-researcher), working through an iterative insider-outsider dialogue as a research team has allowed us to avoid the key issue of partiality whilst benefiting from a level of access, immediacy, and understanding.

5.4.2 Relational knowledge-building

Semi-structured interviews were conducted between May and July, 2022, with 17 Boaters who signed up to participate through online channels. The recruitment process was limited by the exclusion of people without an online presence and those who might not naturally put themselves forward. Interviews were conducted remotely due to Covid-19 precautions, although this was also a restriction for people who did not have the technology to participate in this way. The researchers believe that vulnerable or low-income Boaters are underrepresented in the participant group. These are often the Boaters with the most complex needs and most challenging circumstances, although "*looks can be deceiving (…) and it is not true to say that all boats that look scruffy on the outside are thus on the inside. Nor can it be said that vulnerable people with health needs cannot be found living on 'shiny' boats*" (Worrall, 2019, np). This may have impacted the severity and extent of the effects of water and sanitation resources' upon core capabilities in this study.

Participants' demographics and intersectional identities were of interest to the researchers, but an exploratory approach was taken allowing participants to reveal how personal characteristics interacted with their water and sanitation needs, if they wished. In most cases, demographic-related factors came out naturally in the conversations, but a final broad question was asked at the end of each interview to prompt the interviewee to consciously think about any factors they would like to disclose.

Demographics and Boater type (referring to the many types of both boats and Boaters on the waterways and how they choose to live and cruise) were not specified in the recruitment process, as the researchers wanted to incorporate a range of perspectives. For the purposes of participation, we defined 'Boater' in the broadest possible sense, but we asked participants to self-identify within a range of categories (e.g. liveaboard, leisure, home mooring or not) related to how they use their vessel and their access to services. Boaters who identified as liveaboard (living full-time on their vessel), continuous cruisers formed the majority of those interviewed. This arguably reflects their level of interest in the topic of essential services and their motivation to discuss this as an issue that has an immediate impact on their lifestyle.

The activity defined as ‘continuous cruising’ is protected by legislation (British Waterways Act, 1995),[24] which makes provision for boat owners without a home mooring to navigate the inland waterways, "*provided they do not stay more than 14 continuous days in any one place*" (National Bargee Travellers Association, 2012, np). The interpretation and enforcement of the powers outlined in this Act by British Waterways, and subsequently the CRT, has been the subject of intense debate among waterways campaigning groups and individual Boaters. In particular, opinions differ on what constitutes moving on a continuous progressive journey, in terms of how many miles must be covered in a licence period and the interpretation of the word 'place'. For some licence holders this ambiguity around governance and access contributes to a sense of anxiety, felt by many Boaters, concerning the future of the waterways as dwelling spaces.

This issue can be compounded by an individual’s generalised distrust towards institutions, as noted in previous Local Authority-led research. For instance, a report by Bath & North East Somerset Council was presented with the caveat that, "*one problem we have encountered in our dialogue with Boat Dwellers is their suspicion of officialdom, based on bad experiences in the past*" (Bath and North East Somerset Council, 2013, p.3). It also manifests in accusations that the CRT are trying to price itinerant boaters without a home mooring off the waterways, seen for example in responses to the recent announcements about above-inflation increases to licence fees for five years from April 2024, coupled with a surcharge for boats that continuously cruise (CRT, 2023). The campaign group National Bargee Travellers Association have described this move as "a thinly veiled objective to price itinerant boaters off the water" (National Bargee Travellers Association, 2023, np.). For significant sub-sections of the boating population, relations with the CRT are marked by suspicion and mistrust, which renders communication around the provision, maintenance, and future of essential services difficult. The CRT’s 2021 Annual Boater Satisfaction Survey documented ‘a fall in the Overall Satisfaction KPI from 60% in 2020 to 54% in 2021’ as part of a ‘significant long-term trend of falling overall satisfaction and a trend of rising dissatisfaction’ (CRT, 2021).

As we will go on to explore, these anxieties become imbricated with concerns around the potential loss of services such as water and sanitation and the impact this would have on the viability of a life afloat. As Malkogeorgou (2019, p.216) writes in a recent ethnographic description of continuous cruising in London: "*Most of the debate among boaters – and between boaters and [the CRT] – is focused on access to bins, Elsans and water points, the state of the locks, the banks and mooring spaces, or the lack of space*". Relational knowledge building necessitates an

[24] British Waterways Act 1995 Chapter i Section 17 (3) (c) (ii) states that it is necessary, in order to licence a boat, that "*the applicant for the relevant consent satisfies the Board that the vessel to which the application relates will be used bona fide for navigation throughout the period for which the consent is valid without remaining continuously in any one place for more than 14 days or such longer period as is reasonable in the circumstances*" (*British Waterways Act 1995*).

understanding of the contextual reality of accessing essential water and sanitation services. These complex threads of trust, provision, and communication are not only crucial background for the non-Boater reader, but also help to elicit the deeper meaning of the presence of, absence of, or changes to service points. The following section describes how some Boaters directly experience and use services as resources that give them the 'means to achieve'.

5.5. Results

5.5.1 Water and sanitation resources

Human health and wellbeing are determined by the availability of essential resources for life. This is the starting point of the CA. For Boaters, water and sanitation take a variety of forms but in all cases are key to quality of life, both objectively and subjectively. In the following ethnography we learn from those dwelling on the inland waterways about the important nuances of systemic exclusion within this space, created by the DP, and the diversity of both their attitudes and actions in response to it. We use the sequential structure of the CA to communicate our findings, visualised below in figure 10.

This section begins with a description of water and sanitation resources, which we theorise to be a combination of boat technologies and waterways services. This brief detour into the practicalities of service availability underpins the following two sections, where we explore lived experiences of access (how boaters 'convert' these resources) in order to analyse the wider life implications (in terms of capabilities or 'freedoms to achieve'). Thus we move beyond a flattened picture of all boaters as marginalised consumers, assumed to want or need constant access. Rather, a capabilities framing helps to balance this with an understanding of the divergent desires and requirements of a diverse population, often divided along lines of experienced Boaters and newcomers moving primarily for affordability reasons, rather than a love of the lifestyle.

Water

Most boats have a large water tank on board. Boaters told us of tanks made of steel, stainless steel, or plastic, with older steel tanks often causing water discolouration due to rust. Tank sizing varied between interviewees, ranging from 175 to 700 litres. Some canal boats contain an integral water tank in the bow, with one interviewee describing how their tank sits at the back of the boat, creating substantial imbalance.

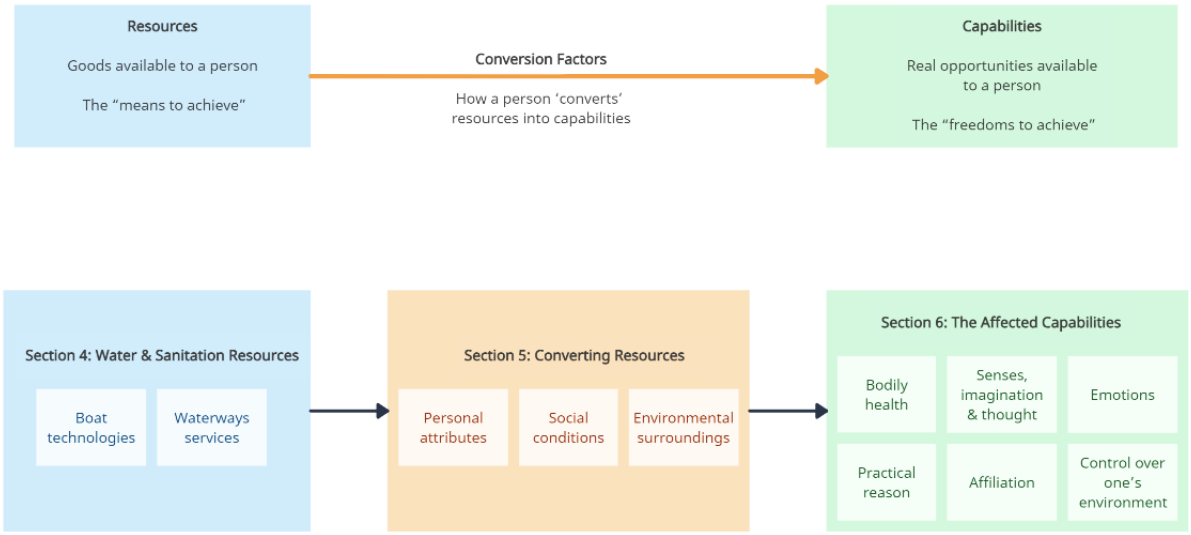

Figure 10: Top line: the Capability Approach (CA) as theorised by Sen, conceptualising how resources are converted into human capabilities. Bottom line: the analytical framework for this study, based on the CA. This line also shows how the results and discussion are structured.

Figure 11: A2's integral steel water tank, painted with potable paint.

Note: The expanded foam tape around the opening was added in an attempt to keep out dust and debris (and occasional worms and spiders). Although it's good to be able to keep an eye on things and access the area for maintenance, I'm not able to adopt the 'out of sight, out of mind' attitude of many of my fellow Boaters. As a result, I keep a separate supply of drinking water, despite having gone to the trouble and expense of having the tank sandblasted and recoated two years ago.

Four interviewees reported keeping back-up containers of 20 or 40 litres, some of which were rolling barrel types for easier transport along the towpaths. Length of time taken to fill the tank

up varied from tens of minutes to hours, depending on tank size and water pressure at the tap. When taking into account travel time, most interviewees explained that a trip to fill up would take between two and three hours on average[25]. In terms of tank quality, some worried that dirt and insects or worms would enter the tank during filling, and some reported grit build-up at the bottom. Three interviewees described how their tanks were hard to clean, given the time it takes and the difficulty of accessing integral tanks. A couple explained that they would drain the tank regularly to ensure that the water was fresh. The majority of interviewees sourced drinking water from their tanks, with some using Aquatabs or Milton sterilising tablets as treatment.[26] Three interviewees did not drink tank water, instead drinking from separate storage containers that they filled up at water points. A couple bought bottled water, either out of preference or necessity.

Figure 12: The 5L bottle is a popular canal accessory.

Note: I use my 5L bottles for drinking water, as I prefer not to drink from the integral water tank. They are rinsed and refilled roughly every two weeks and kept in service for several years.

[25] On the WHO JMP service ladder, this would equate to "limited" service: "Drinking water from an improved source for which collection time exceeds 30 minutes for a round trip including queuing" (https://washdata.org/monitoring/drinking-water). The authors note that this is technically in contradiction to the SDG goals, to which the UK has signed on.

[26] International data on water quality shows that deterioration is substantial between water source and storage (Shields et al., 2015). Although this hasn't been studied in the specific context of Boaters in England & Wales, it could suggest that water in canal boat tanks may not meet drinking water standards.

The interviewee buying bottled drinking water out of necessity did so because they fill up their tank with canal water using a self-built, multi-stage filtration system. Although only one participant in our study was currently using such a system, it became apparent through multiple conversations that this practice is increasingly common among Boaters. The participant recounted their story of being unable to move their boat during Covid-19 lockdowns and how the nearest water point became very unhygienic due to cross contamination with an adjacent Elsan toilet disposal point. Before the lockdowns their partner would collect water manually, but they became anxious about going out and uncomfortable using the water point because of the unhygienic conditions, particularly as they are disabled. After researching online and meeting other Boaters who had built their own systems, the interviewee explained: "*I decided enough was enough really, and I created a water filtration system from scratch*".[27]

With two children also living on board, this system provides the family with a sufficient quantity of water to fulfil their needs, except for drinking. However, the interviewee expressed an underlying concern about water quality and safety: "*There's still this thing in the back of your mind that you're testing for a lot of stuff but you might not be testing for the one thing that's damaging you*".[28] This situation reveals how a family that outwardly appears to have sufficient access to water is nonetheless experiencing consistent low-level of anxiety beneath the surface.

This range of experiences demonstrates Boater agency (different responses to the level of, lack of, or standard of service provision – chiefly the popularity of self-provisioning). Even when services are lacking, people find workarounds. Some are happier to do this than rely on a service they cannot control.

[27] I13, 27 May 2022
[28] I13, 27 May 2022

Figure 13: An Elsan station on the River Avon near Swineford.

Note: A particular hygiene concern is that of people using the wrong hoses, particularly as sanitation facilities (Elsan disposals and pump out machines) and drinking water provisions are often found adjacent to one another. I've heard several Boaters tell stories of watching in horror as people hiring boats for their holidays innocently fill their freshwater tanks using the hoses provided for rinsing out toilet waste tanks.

Sanitation

There are multiple types of toilet sanitation systems on boats, the most common being pump out, cassette, and separating systems (more commonly called composting or waterless toilets). Pump out systems involve an integral tank where waste is collected (often from a more 'traditional' flush toilet on the boat). Periodically, the boat must be moved to access a pump out machine, where a pipe is connected for waste removal. These machines are either privately maintained (and charged accordingly) at marinas and boatyards or provided by the navigation authority. CRT machines use cards priced at £20 each, which generally require a postal address to order and receive. These cards are often sold at a premium if Boaters are able to find physical locations in which to buy them. Further, they often jam in the machines and do not work correctly. Cassette toilets have smaller containers that can be ejected from the toilet and manually emptied into Elsan points.

Four participants were using separating systems – waterless toilets with large boxes on the boat roof for the storage and processing of solid waste. They reported finding it hard to dispose of the composted waste, with all of them using family or friends' gardens rather than an official service,

as none are currently available outside London.[29] Motivation for composting was that it is more hygienic in terms of disposal (avoiding the inevitable splashback from the Elsan points) and better for the environment when compared to other systems. Those who separated urine sometimes disposed of it in Elsanpoints, with some disposing of it in bushes on the towpath or in the canal when services were hard to find: "*Occasionally we put urine in the canal, which I'm quite ashamed to say out loud. I don't know if I should do that. We've kind of been in denial about whether that's good or bad*".[30]

Participants using traditional pump out or cassette systems noted higher levels of disgust when disposing of sludge. On average, a cassette would last about two days, so most agreed that three cassettes was the ideal number, lasting a week before they would have to empty.[31] Pump out systems could be equally problematic in terms of maintenance, finding disposal points, and using them. A couple of interviewees expressed concern that pump out facilities owned by the navigation authority were becoming less common, and they were increasingly having to turn to expensive (though often better maintained) marina facilities.

For laundry, multiple interviewees explained that they had twin tub or 'camping' washing machines on board, which only use small quantities of water. One reported adding a boiled kettle to their machine, as these systems usually run off cold water. An issue with washing clothes on the boat was space and heat for drying and the risk of damp. One interviewee explained how they would sometimes hang a washing line in the trees by the towpath, but how this felt strange to do in a public place. Others used laundrettes, but this was often described as inconvenient without a car and without facilities located near the canals. One interviewee said they thought that a few laundrettes had caught onto the fact that Boaters were using them and started offering delivery services: "*It's just so much easier and one thing I don't have to deal with, but I'm pretty sure the last time I did he charged me £40 (…) but yeah, it's so expensive*".[32]

Another participant explained that they did their washing at work. Most people relied on friends and family as a supplement to on board systems and laundrettes. Common issues with this related to the time it would take to wash and dry and the inconvenience this caused.

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[29] In London, Circular Revolution is the main 'service provider' for disposing of composted toilet waste. The organisation recently partnered with University College London to conduct research on how to expand services and make them more accessible within a complex regulatory environment set by the Environment Agency. https://www.circularrevolution.org/

[30] I11, 18 May 2022

[31] It is a common complaint that one cannot buy extra cassettes for most models, and therefore Boaters have to wastefully buy several whole toilet units in order to build up a set of spare cassettes.

[32] I6, 20th May 2022

Figure 14: Hackney Wick pump out, Lee Navigation, East London. Out of service more often than not.

Laundrette List returns with new edition

REGARDED by many as an essential when out boating, the Aylesbury Canal Society Laundrette List returns this year.

The list includes towns and villages with laundrettes listed alphabetically with directions from the canal and some extra information which you may find useful.

Canals and rivers are also listed alphabetically showing the towns and villages on those navigations where laundrettes exist.

There are many changes since the 2020 edition with a number of long-established laundrettes having closed, some working very limited hours and some having different working practices such as only doing service washes. Others are only operating on a self-service basis.

The Aylesbury Canal Society Laundrette List 2022 edition is now available from IWA Sales at https://waterways.org.uk or from IWA Sales, Island House, Moor Road, Chesham, HP5 IWA (tel 01494 783453) for £5 (payable to IWA Sales) including post paid to UK addressees.

Figure 15: Laundrettes are big news!

Anxieties about service withdrawal and inflexibility are evident in many participants' recounts of sanitation services. Available services on the waterways are often supplemented by those beyond the waterways, either in the public or private sphere (for instance, buying bottled water to drink, using taps beyond the canal, or accessing toilets and showers at work, cafes, or the gym). This blurring between 'formal' and 'informal' provision is evident in the international literature, where many people supplement or rely on creative, unofficial ways of accessing services. This common reality reveals institutional failures to provide full and appropriate services, as well as the shortcomings of numbers-based targets employed without contextual understanding (Norvixoxo et al., 2022).

Hygiene

For bathing, most interviewees had facilities for showering with hot water on board, and the majority reported taking 'navy showers' - where you turn the water off when lathering soap and shampoo. In every instance this was motivated by water saving. One interviewee wished that they could have a relaxing shower from time to time, and another explained that they don't wash their hair so often; "*I wash my hair like once or twice a week. Partly because it doesn't need it, but*

also partly because I don't want to waste water".[33] Yet another was proud of how little water they needed to use: "*They say seven to ten gallons of water [are] used in a shower. Well, you'd be jolly lucky with ours if we've used four litres*".[34]

One interviewee said that they used navigation authority shower blocks whenever they passed these facilities in order to save water on board. Some people supplemented this by showering at work and the gym, both to save water and to have a more satisfying washing experience. A limitation of having a warm shower for a couple of interviewees was the waterways policy of not running your engine before 8 a.m., which became a problem for those wanting to shower before work. Another participant explained how they would rather have a bath for their young son to wash, but that limited space was an issue.

In terms of environmental hygiene, how and when people cleaned their boats varied. Some found it important to regularly clean the outside, which was usually done with canal water or a hosepipe when filling up at a water point. Greywater tended to be used for cleaning the inside of the boat and for watering plants. Most interviewees would wash dishes once or twice a day, as it is the general attitude among Boaters that it saves water to wash everything at once rather than do small washes throughout the day. One interviewee explained how her routine was to empty her pump out toilet, then clean the bathroom, and then take a shower, so that she felt clean after completing those tasks.

This section has outlined the fundamental water and sanitation resources available to Boaters, as well as some of the ways in which Boaters respond to these combinations of waterways services and boat technologies. This provides a foundation for understanding the place of resources in relation to their wider impacts upon Boaters' lives. In the following section, we build on this to explore the significance of personal, social, and environmental factors in converting these resources into capabilities or 'freedoms' to achieve a desired quality of life.

5.5.2 Converting resources

Some interviewees reported having modified their boat's original sanitation or water systems, while others explained that they would like to upgrade their boat technologies but were restricted by time, money, or expertise. The CA recognises that resources are used in a variety of ways, denoting this process as 'converting' them into capabilities. Various factors contribute to this conversion process, grouped into three spheres of life: individual personhood, societal 'rules', and surrounding environments. The availability of a particular water point or sanitation station may

[33] I11, 18 May 2022
[34] I4, 13 May 2022

be restricted in one or multiple spheres, creating advantages and disadvantages for particular people. Participants' experiences around using or converting resources are discussed below.

The personal

Physical attributes were important personal factors that also had implications for social factors. For a couple of interviewees, these were physical disabilities which had a strong influence on their daily life:

"My partner is seventy-four now. He is mobility disabled (…) [and] I am de-facto his carer (…). So running out of water and having to go five or six hours somewhere else to get water, you know, it's a big deal. It's a big deal. There's no other way to put it. It's a big deal"[35].

In cases of physical disabilities and neurodivergence, the partner who acted as a carer faced excess pressure to take responsibility for and carry out the water and sanitation tasks on board. There is a CRT policy for supporting Boaters with disabilities, but both interviewees who had gone through the process of registering their disability with the navigation authority described it as overly complex and bureaucratic. One recounted that, although they were in receipt of support from the local council, the navigation authority, and social services, no institution had sufficient understanding of what they were experiencing and the holistic support they needed:

"When social workers come 'round they kind of, because the boat looks nice, they kind of assume that everything's in order, and you try to explain to them the difficulties as well, but they don't understand those difficulties (…) so they're sort of brushed under the carpet"[36].

[35] I16, 5 July 2022
[36] I13, 27 May 2022

Figure 16: Service station provided by Wessex Water/CRT on the River Avon near Swineford.

Note: Some service stations – such as this one – can be particularly challenging to access: steep, slippery (to the point of requiring signage!) and overgrown, and in this case only open from spring to autumn.

For most other interviewees, physical attributes around strength and height were important and interrelated with gender, age, and (dis)ability. From the 'insider' researcher's observations (for instance, taking part in discussions in several Facebook groups for women Boaters) the outdated narrative that women are unable to carry out physical and technical tasks on board can be pervasive on the waterways, though it is something that many female Boaters reject. Roberts (2019) revealed similar themes, with participants describing feelings of dismissal or discomfort around their assumed lack of competence with gender-normatively associated tasks and expertise, such as diesel engine maintenance. No participants in this study noted gender identity as a restriction in and of itself. If physical tasks were considered challenging, this would be related to multiple intersectional factors. The main gender-related concern, which was raised in a number of conversations, was the safety and perceived safety of female Boaters. Walking along dark towpaths to empty cassettes and approaching urban service points where groups of people were congregated are two situations in which lone women felt unsafe.

"That's happened to me where there's been a gang or something sitting on the lock gates and I'm just gonna come back later (…). Maybe you do come back later or maybe you don't because

something else has come up. So [there is] something about it being in public and that just makes [the experience] all the more fragile"[37].

These situations resonate with the international water and sanitation literature, where the experiences of women and children around facilities have been found to be precarious in multiple contexts (O'Reilly, 2016; Tallman et al., 2023). Instances of violence against women and gender-based violence around water and sanitation services have been linked to the vulnerability of intimate hygiene practices combined with the public location of shared facilities and their distance from home (Sommer et al., 2015; Fisher et al., 2018). In this research, safety has been identified as a more prevalent concern than women's ability to perform physical or technical tasks.

Multiple participants explicitly or implicitly revealed the opinion that personal attributes were what determined how much people struggled with water and sanitation tasks and the extent to which these issues impacted their lives more widely. Being frugal, organised, and planning ahead were considered by some to be the reasons they did not personally struggle with the potential negative impacts of access to services that may affect others, taking the view: "*I'm pretty clued up and, you know, fairly able to deal with things*".[38]

A couple of these interviewees conceded that other factors might play a part too, such as their flexible work schedules and insider knowledge about which facilities were best and how to access resources like pump out cards. One suggested a social factor that might also be important: "*I don't know how much of a safety net there is if you're struggling, other than just other Boaters who are around*".[39] Although many maintained that, as water and sanitation tasks were simply a part of life on board, the main course of action was to improve personal organisation and planning skills.

Therefore, perceptions of how other Boaters experience water and sanitation on board are informed by individual experiences, often assuming that these will be broadly similar. Such findings reveal that personal conversion factors affect Boaters' experiences of services in diverse ways and show that this diversity might not be obvious to Boaters individually.

[37] I1, 25 May 2022
[38] I3, 24 May 2022
[39] I3, 24 May 2022

Figure 17: Widebeam boat with extra water tanks.

Note: Some Boaters may be perceived to have more financial and material resources: For instance, I noticed this widebeam boat that seemed to be almost brand new and that had extra water tanks in the bow. However, these (assumed) extra financial resources are not yet matched by the experiential knowledge to anticipate that the water will go green with algae if left exposed to the sun, or that such large heavy tanks will adjust the trim of the boat and be tricky to empty in order to make use of the stored water.

The social

An important consideration that precedes the question of access to services is the reasons why people move on board in the first place. Although this was not an explicit question in the interviews, some participants offered this information as context for their experiences and attitudes. The theme emerged that those who chose to become a Boater predominantly because they wanted to experience the lifestyle generally had a more positive attitude towards the condition and availability of services than those who moved on board due to financial reasons. (These are the two biggest reasons people move onto canal boats, followed by connecting to an off-grid lifestyle, alternative community, inland water heritage, and low carbon footprint [Sterrit, 2022].)

In this study, the attitude of those who intentionally and freely chose the Boater lifestyle can be broadly summarised by the following quote: "*It's a means to continue travelling. It's a means to*

move. I feel very lucky that the technology is there to live a very comfortable lifestyle in comparison to how boat families would have had it in the 19th and early 20th centuries".[40]

Those who lived on board primarily for affordable accommodation often had different attitudes, expectations, and needs regarding service provision. One interviewee who has lived on boats off and on for 30 years was concerned about the trend in people turning to the waterways for a means to live affordably: "*Housing is so unaffordable (…), but people are living on the water now and I don't think [they're] understanding it*".[41]

Another participant explained this tension in the following way:

"Maybe in an ideal world these facilities would all be available every hundred yards or so. But if that was the case (…) boating would be a little less fun. But that's one extreme. The other extreme, I think, is very unhealthy. It's not good from a mental health point of view. You know, unnecessary jeopardy causes unnecessary anxiety"[42].

This reveals how one person's fun, dynamic challenges can constitute another person's 'unnecessary jeopardy'. Most interviewees had multiple reasons for living on board, and thus a more complex attitude towards services. A middle ground perspective could be expressed as: "*It does feel, in its own way, freeing (…) You just have what you need and you're aware of what you use (…) [but] there's been some days where I just can't actually manage any of it*".[43]

The environmental

The environmental conversion factors that emerged were mainly related to the condition, frequency, and accessibility of service points, as well as to seasonal variations in weather and conditions. Most interviewees had experience with broken service points, and the reported speed with which they were repaired varied greatly from very promptly to a matter of weeks, months, or even remaining permanently out of use. The main problem with unusable facilities was the time taken to cruise to find alternative sources.

[40] I12, 24 May 2022
[41] I8, 30 May 2022
[42] I14 1 June 2022
[43] I1, 25 May 2022

Figure 18: A sign at a CRT service point on the Kennet and Avon canal.

Note: Distances between service points can be measured in the hours it takes to cruise between the points (including working out 'lock miles' by adding the distance in miles to the number of locks that must be navigated, before dividing by three to ascertain the number of hours the journey should take). Longer narrowboats may also have to find the nearest 'winding hole' in order to turn around and return to a service point, making journeys even longer.

Some interviewees were concerned that these issues were becoming more frequent, forcing people to turn to paid services at marinas. One explained that they used pump out services at marinas almost exclusively, because they were consistently more readily available than navigation authority owned ones. People who used Elsan disposal points often commented that they could be unhygienic to use: "*It's the worst thing I've ever had to deal with. The Elsans were horrendous. Just seeing other people's turds was just (…) They were disgusting, broken. The hose that hangs off – I don't even know what that's for. Just – eugh*".[44]

Despite the strength of disgust expressed by several respondents on this point, a couple of interviewees considered Elsans to be fine to use in general. Both the frequency and condition of different types of facilities often depended on location. Within cities, more service points tended to be available but with a higher number of people using them, so blockages and hygiene issues were more common. In rural areas, issues tended to relate to broken facilities or large gaps in between service points.

[44] I7, 17th May 2022

Figure 19: Broken tap on a mooring pontoon in Bristol Floating Harbour (left); a repaired tap on the Kennet and Avon canal (right).

Note: Service point maintenance issues are highly visible in the fact that so many taps on the system have been repeatedly fixed and adapted with found materials, rendering them idiosyncratic to use and potentially presenting accessibility issues.

Water points specifically varied in terms of pressure, which had knock-on effects for the time taken to fill up a boat tank and resulted in sometimes lengthy queues. This was often made worse by hire boats in the summer (rental operators encourage hirers to fill up most days, so as not to run out of water due to their mains water-adapted usage habits.). Some taps could be difficult to use, requiring tools to open, as shown in figure 19. But, in general, water points were less of a problem for people than sanitation: "*Occasionally, yeah, at popular points there's like one water tap and there might be – we might be the third boat along. But we just kind of wait it out*".[45]

[45] I5, 18 May 2022

Figure 20: Water provision on the visitor moorings in Bath (Kennet and Avon Canal).

Note: The water pressure at this tap was so low that it wasn't sufficient to make my 'expandable' hose stretch to reach the tank at the bow of my 60ft narrowboat. We left having filled up a few 5L bottles, but with an almost empty tank. Also of note here is the somewhat confusing 'no mooring' signage and the addition of a plastic bag, perhaps as part of an attempted amateur repair.

Boaters also described various seasonal impacts. In the winter, the presence of water is noted in different, unwanted places with some describing condensation issues leading to damp, mould, and health problems. In the summer, people drink more water and take more showers, as some boats can get very hot from the sun: "*I remember having, like, flannels all over me when it was (…) really hot the first summer on my boat, because I just couldn't cope (…) yeah, if you're not moored under trees it's literally like being inside an oven*".[46]

Overall, a myriad of conversion factors were found to affect participants' use of water and sanitation resources. The number and severity of these factors determined the extent to which a person struggled to fulfil their needs. How easily and fully one could meet their needs affected quality of life more widely (though not necessarily or exclusively negatively), influencing their wellbeing and capabilities in nuanced ways, which are discussed in the following section.

[46] I9, 20 May 2022

5.6 Capabilities

The preceding sections tell the primary story of our ethnographic data, describing the availability of water and sanitation resources and the ways in which they are used by different people. In this section, we draw out the implications of our data analysis through the CA framework, demonstrating particular effects using services has on participants' capabilities.

Capabilities are defined as the real opportunities available to a person, based on their use of available resources (Sen, 1985). They can also be understood as the 'freedoms to achieve' a subjectively good life. The ideal method of defining specific capabilities is a grounded approach in a particular context (van der Boor et al., 2020), however we chose to conduct our analysis using the most well-established generalised definitions, as deduced by Nussbaum (2011). We recognise the limitations of general categories, but we feel meaningful insight can be gained through using them in this study given its exploratory and formative nature.

Nussbaum (2011) defines ten core capabilities, outlined in table 8. Our findings identify that at least six of these capabilities are affected by access to water and sanitation resources in this context. These are shown in italics and discussed individually in the following section. This discussion reflects our data, which shows most effects described by interlocutors to be negative. However, we also find positive experiences of water and sanitation services that are supportive of certain capabilities. For example, one participant reflected that they felt 'lucky' to be able to live in relative comfort while travelling on the waterways.[47] This Boater experienced service provision that facilitated the freedom of an itinerant lifestyle, causing them to feel more in *control over their environment* and supported in their *emotional* wellbeing.

[47] I12, 24 May 2022

Table 8: The ten core capabilities as defined in Nussbaum (2011). They support individuals' ability to live in ways that they choose, enabling health, wellbeing, and personal freedoms.

	Human capability
1	Life
2	***Bodily health***
3	Bodily integrity
4	***Senses, imagination, and thought***
5	***Emotions***
6	***Practical reason***
7	***Affiliation***
8	Other species
9	Play
10	***Control over one's environment***

5.6.1 The affected capabilities

Bodily health is found to be influenced in subtle ways in this research. The sample population did not generally lack access to basic water and sanitation to the extent that it substantially affected their bodily health. The only case in which this was apparent was a participant whose child once had an infection due to a suspected hygiene issue that arose from being limited to showering rather than bathing on board the family's boat. Other situations included: 'holding on' to go to the toilet at work, greatly reducing frequency of showering to save water, and feeling unable to exercise because of hygiene restrictions caused by a lack of sufficient water on board. These do not have 'provable' effects on bodily health, but their potential long-term impacts can be inferred. Mental health is also related to these situations, though this is more clearly incorporated into other capabilities.

Participants' ***emotions*** were repeatedly found to be affected by water and sanitation. The predominant emotion was a scarcity mentality that caused people to alter their natural hygiene behaviours, which contributed to tensions within interpersonal relationships and restricted overall emotional peace and wellbeing. Multiple people stated that they felt anxious or worried about running out of water, as well as a sense of disgust during emptying and maintaining toilets. One

interviewee described the ‘constant pressure’ of water and sanitation tasks, with another explaining how this pressure affected their wider life in terms of the energy available to work and exercise. However, other participants felt neutral or positive about the constant responsibility of water and sanitation tasks, suggesting that whether this is seen as pressure or a satisfying routine (or even a source of pride in practising a low-impact lifestyle) depends on the person’s wider situation and attitude. One interviewee who was a professional in the mental health field commented:

“*The CRT disposal points have been consistently diabolical on the K&A [Kennet & Avon]. I actually raised this with CRT (…) It occurred to me that it’s an area where the ability to maintain decent sanitation is going to cause a high degree of anxiety amongst users. Especially users who are in any way vulnerable. Even more especially with boat users who might lack capacity*”[48].

Another interviewee recalled when they began continuously cruising and had to move to fill up with water regularly: "*When we started cruising, I was like, 'Wow, this is, this is actually really big'. Like I said, I couldn’t move because I had the baby, so my partner had to do it (…) I think that impacted our mental health massively*".[49]

A different participant explained how they and their partner were considering moving onto land, in part because they would have more time to play music and pursue other hobbies. This was something they considered would be more possible without the pressure of water and sanitation tasks. In this case, the capability of ***sense, imagination, and thought*** was restricted.

The capability of ***affiliation*** is defined by Nussbaum (2011, p.34) as being able to:

“(A) recognize and show concern for other human beings (…) to be able to imagine the situation of another (…) [and] (B) having the social bases of self-respect and nonhumiliation; being able to be treated as a dignified being whose worth is equal to that of others”.

Part A was affected in cases where some participants felt they were more able to cope with water and sanitation tasks than other Boaters. This difference often fell along the divisions of experience Boaters and newcomers. More experienced Boaters expressed frustration about others blocking disposal points by putting unsuitable material (such as wet wipes) down them, and those who chose to compost when there wasn’t yet an official system of disposal available (leading to a glut of Boaters 'bagging and binning' their solid waste). This demonstrates the effect of this perception on the freedom to ‘imagine the situation of another’. More experienced Boaters often had developed strategies for working with the available services, and some had the financial resources

[48] I14, 1 June 2022
[49] I2 16 May 2022

to purchase additional resources or technologies. New Boaters with a tight budget were much less able to do so, and some had less care for the boating lifestyle.

Additionally, the concept of dignity is challenged in cases where interviewees expressed discomfort at carrying out personal activities in a public space, including drying clothes and transporting toilet waste. A couple also explained how, during Covid-19 lockdowns, increased numbers of people walking on the towpaths left them feeling anxious to go out and unhappy at the cleanliness of the towpath, service points, and nearby green spaces.

The condition of ***practical reason*** was found to be affected in many cases when interviewees' movements and cruising patterns were affected by water and sanitation needs. "*Engaging in critical reflection about the planning of one's life*" (Nussbaum, 2011, p.34) appears to be often hindered by the availability and location of service points. Similarly, ***control over one's environment*** is affected by the lack of influence boaters have over water and sanitation services, both politically and materially. Politically, it was apparent in many interviews that people felt they had little control over the provision of services on canals. For some, this translated to a fear that services were gradually being closed in order to force them to use private services. This is by extension perceived as a threat to the lifestyle and future viability of continuous cruising as liveaboard Boaters, and connected to the teleological drive towards fixity and the chargeable mooring model that some Boaters accuse the CRT of prioritising in their governance and maintenance strategies. Materially, some interviewees wished to have different boat technologies, but due to cost, time, and expertise they could not achieve these changes.

The effects of water and sanitation on these six core capabilities reveal some of the ways in which essential services are foundational to Boaters' freedoms to achieve the types of lifestyles they value. Untangling these facets of life is helpful for showing some of the specific ways in which infrastructure interacts with the end users. We find that these interactions are deeply situated in the subjective lifeworlds of individuals, often causing them to be difficult to understand from the 'outside'.

5.7 Conclusions – Freedoms afloat?

This article evidences six core human capabilities (as described by Nussbaum) that are affected by access to water and sanitation services on the inland waterways of E&W. Journeying from resources to conversion factors to capabilities, we trace the ways in which essential services are used by different Boaters as integral parts of their lifestyles. This study shows that access to – and capacity to convert – resources can impact physical and mental health, positively as well as negatively. Restriction is not necessarily or solely perceived as a negative (some participants

considered this an element of the 'lifestyle' that Boaters sign up for when living 'off grid', while others expressed pride in, and derived satisfaction from, living a low-impact lifestyle). Nonetheless, for some, restricted or denied services constituted a significant negative factor with wide-reaching implications for their lives. We contribute to and extend the existing body of literature that applies Sen's CA to water and sanitation by investigating it in a novel context, through an ethnographic lens.

This study foregrounds differences in the Boater population across a complex spectrum between experienced Boaters with a range of financial resources but s strong desire to live the boating lifestyle, and newcomers who mostly moved on board due to financial restrictions. We emphasise the diversity among Boaters as a group, documenting a range of ways in which resources are used to support plural and at times opposing interpretations of 'freedom'. This finding is particularly relevant to ongoing research with itinerant populations or travelling peoples whose access to service provision is partial and/or contested. It highlights that assumptions cannot be made from the 'outside' about the kinds of service that these groups (and others) may desire. Furthermore, it acts as a reminder of the complex strands of association existing within a community or population group. We identify one of these key strands within Boating populations as the motivation for moving on board which, in our study, strongly affected the level of service that people expect and desire.

Itinerant groups are just one of the many who find themselves living within the DP. This study is the first ethnography in E&W to document the experiences of one such group. The very existence of this paradox is at odds with the principles of equitable service provision, non-discrimination, and fundamental human rights. As well as theory contribution, this research is timely for those dwelling on the water, as the numbers of Boaters continues to increase. Some participants expressed concern that without adaptation of services to meet this pressure, new inequities and public health issues may emerge. As the main navigation authority responsible for the canal system in E&W, the CRT also recognises this trajectory and has recently responded by pledging a new minimum standard for service provision throughout the network.[50] The extent to which navigation authorities are responsible for providing services, and how this interacts with their statutory mandates to maintain the navigations under their control are questions requiring further research.

[50] A recent CRT blog post publicized the new "Customer Service Facility Policy Statement setting out the essential boater customer service facilities (CSF) the Trust will provide". The maximum cruising time to access essential services is one day's cruising for water, waste disposal, and Elsan points, and two days' cruising for pump outs. https://canalrivertrust.org.uk/boating/boating-news-and-views/boating-blogs-and-features/customer-services-facilities-policy

Without the affordances of household water company customers, Boaters in E&W fall through the cracks of institutional responsibility for service provision. While more experienced Boaters, those who chose to move on board with a desire for the lifestyle, were comfortable taking on the responsibility for self-provision and planned ahead for when services would not be available, newcomers who wished to stay in one place and use their boat like a conventional home expressed desire for an institution to take active responsibility. The main institutions these Boaters had interacted with were the local council and CRT. Water companies were always one step removed from boaters, likely because they are not configured as customers so have no direct relationship with one another. Equally all Boaters are water consumers, but it appears that the most possible route of responsibility would be a mediating organisation (either CRT or the council) who would take on responsibility for Boaters on the behalf of water companies.

We find that CRT are very resistant to this, as they emphasise that they are not a service provider or a landlord, yet they do have responsibility for ensuring people can live on the waterways. This is akin to taking on this intermediary role, but CRT would only do so if some resourcing was provided, either by government or by the water industry. Distinguishing between Boaters who cannot or will not take on full self-provisioning could at least reduce the numbers that an institution needs to take responsibility for. The current lack of clarity in this area only compounds those who are already the most marginalised:

"[Some of] the kinds of people that end up living on boats tend to be finding themselves a bit marginalised anyway, and so then when you exclude them from services, exclude them from water provision, you're further marginalising them"[51].

This sentiment of marginalisation within the DP is important to emphasise when people find that it represents their lived experience and works to facilitate the fulfilment of their rights. However, our research shows that it is simplistic to classify all Boaters as marginalised or excluded from services, even though they live within the DP. People enter this lifestyle for different reasons and with different priorities, in many cases connected to their personal choices and freedoms. Some may view the waterways as spaces of informality, alterity, and distance from authority; seeking an escape from the housing crisis; or searching for alternative communities and low-impact lifestyles. Methodologically, this paper suggests potential ways to build relational knowledge of a constituency that is somewhat invisible to utilities providers, particularly one that has its own complex internal dynamics and divergent relationships with expressions of authority.

[51] I13, 27th May

This speaks to the wider implications of this research for theorising the concept of equitable service provision and the principles for co-creating them. Definitions of 'safely managed' services must reflect the needs and desires of the population in question, and top-down approaches tend to be packaged with 'outsider' assumptions. In our study, auto-ethnographic knowledge and use of the CA as an analytical framework enabled our emphasis on the perspectives of individual Boaters. We recommend more studies on water and sanitation equity take a similar approach, focusing on the principle of radically centring the people who use, and rely upon, these essential services.

5.8 References

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Chapter 6

The Great Stink in the 21st Century? A Political Ecology of Sewage Discharges in England's Waters

The previous chapter explored water insecurity among boaters, who are in a precarious position due to being excluded from customer status. We found a diversity of experiences, perspectives, and desires for a free life. A number of people highly valued the environment and were seeking a greater connection to nature through this historically-rooted and transient lifestyle. Life on the water means that boaters are often some of the first people to notice and be affected by pollution events in environmental waters.

There are growing questions in E&W around wastewater management and the quality of water in the environment. These issues are strongly connected to secure access to services for all people. Water activists are increasingly influential in this context, and the drivers and effects of their campaigns are complex, despite being positioned in popular discourse in a one dimensional manner; as the moral defenders of water against morally corrupt water companies.

My third doctoral study explored the social and political dimensions of the increasingly pressing issue of sewage discharges into rivers from CSOs. This is my final and largest doctoral study, and as such has been split into two papers. This chapter presenting the first paper which applies a political ecology lens to this issue, drawing from historical literature and ethnographic data in Yorkshire. It also discusses findings about hydro-social relationships and the nature of activism, which are examined in greater local detail in the subsequent chapter.

6.1 Abstract

In 2017, river enthusiasts in Yorkshire and Oxfordshire alerted government to their concerns over local sewage discharges. These early actions have sparked such a rise in the national profile of sewers, that the Labour party called them 'emblematic' of the decline of Britain's public services in their 2024 election campaign. Dominant public narratives assert the moral corruption of water companies, and the right action of activists in challenging them.

We present a Political Ecology analysis of sewer discharges into rivers, based on findings from over a year of primary ethnographic research in Yorkshire combined with historic and modern literature. A literature synthesis establishes how rivers and sewers in England have been extensively produced by anthropogenic activities and, subsequently, how their modern forms derive from the societal configurations of past centuries.

This background informs our discussion of the contours of sewage phenomena in three locations in Yorkshire. We trace how local actors problematise discharges into rivers differently, based on the hydro-social knowledges they create. Our data reveals that the terrains of river health and sewer functionality are highly contested between stakeholders. Further divergences are apparent between and within activist groups. Comparing data from Ilkley, Knaresborough and Bradford highlights which activist narratives have become amplified and which have been marginalized. Divergent hydro-social knowledges in each location leads to our analysis breaking down the concept of community, so often employed in mainstream public discourse.

Overall, taking Political Ecology approach and applying a hydro-social lens enables novel investigation of this modern conjuncture. While dominant activists have undoubtedly applied the largest external pressure on the water industry in decades, this has not yet triggered fundamental changes to water or environmental governance. Although the movement is still unfolding, so far it has been most successful in maximizing loopholes and securing special treatment, risking the reinforcement of existing social configurations and inequities in England.

6.2 Introduction

Public discourse on sewage discharges into water bodies has grown exponentially in recent years becoming, by 2024, one of the most pressing political concerns in England. It is a leading issue in the summer general election, with the Labour party calling it emblematic of 14 years of failed Conservative leadership (Labour, 2024). Seminal public health scholars ask; "*What will it take for a new sanitary revolution in the UK?*" (Middleton and Saunders 2024). The general public direct anger at private water and sewerage companies, with blame and mistrust soaring to a degree reminiscent of widespread opposition in the 1990s (Sylvester et al., 2023).

We pinpoint the origins of this discourse in January 2017, when England's 'sewage sleuths' submitted a freedom of information request to the Government Department for Environment and Rural Affairs (DEFRA), seeking to discover the full extent of discharges in the River Windrush. They found that sewage had been released into the river 240 times over the past three years. They subsequently gathered environmental and sewerage data, calculating in great detail the wastewater flows through the system and into the river (Bullough, 2022). This work revealed publically many of the water and environmental governance practices that had previously been taking place behind closed doors.

By 2021, the Environment Act made it a statutory duty for the Environment Agency (EA) to publish the Event Duration Monitoring (EDM) data they obtain from water companies, escalating the tide of publically available information on sewage discharges (Environment Agency (EA),

2022a). This enabled activist groups to evidence and amplify certain issues in public discourse, including the protection of public health and ecosystem functionality in water bodies (Albini et al., 2023; de Hoog, 2023). Both issues are broadly attributed to sewer capacity and design, particularly discharges from Combined Sewer Overflows (CSOs) – a component of the wastewater system designed to allow sewers to spill into water bodies during 'heavy rainfall events' (Department for Environment and Rural Affairs (DEFRA), 2023a). Public scrutiny has been compounded by an increasing awareness of the profit levels in the water industry, with shareholders receiving £72 billion in dividends since privatisation (Buse and Bayliss, 2022).

Most existing research applies quantitative methods and technical perspectives to combined sewer discharges, in particular modelling various ways in which they produce risks to human and environmental health (Giakoumis and Voulvouli, 2023; Kay et al., 2017; Sterk et al., 2016; Younger et al., 2022). There is minimal research examining their social and political dimensions. Usher (2023) employs the human geography concepts of infrastructural politics and the water commons to examine the recent public and political response. This is a valuable basis for developing a qualitative body of work, however it does not produce primary data. Therefore, we extend this qualitative literature by undertaking ethnographic research to gather a range of diverse social knowledges on sewer discharges.

We conduct ethnographic research in three, interconnected locations in Yorkshire, and analyse them using a Political Ecology (PE) perspective. This region is central to sewage activism, with the Clean Ilkley River Campaign taking on a leading role in shaping activist strategy across England and acting as an example for successfully securing new investment. Ilkley is a growing, affluent town situated in the picturesque Yorkshire Dales, but still within a 30-minute train journey to Leeds. Local activists were able to use a novel campaign, backed by university and political connections, to secure the first designated inland bathing water in England, unlocking millions of pounds in investment (EA, 2024a). We were also able to draw from our geographical proximity as researchers living in this region, as well as finding local entry points through existing relationships at the University of Leeds with water and river actors. Our insights are both specific to the place-based phenomena in Yorkshire, and are relevant more widely given the national prevalence of this issue and the centralised nature of water and environmental governance in England.

6.3 The production of water environments and infrastructures

This section presents a literature review to establish the background of our study. It overviews the historical context of river environments and sewer infrastructures in England, summarising how they have been extensively produced by societal processes to take the forms they exist in today.

6.3.1 England's waters between 1500-1989

Rivers are inseparable from landscapes and land rights. During the Medieval period, much of the land in England was communal pasture land cultivated under an 'open-field system'. In 1235, King Henry III passed a statute allowing manor lords to enclose common land using walls, fences and hedges, and by the mid-18th century 20% of England had been legally enclosed (Moreton, 2023). This contributed to the displacement of many rural 'commoners' (small-scale farmers and labourers) forcing mass migrations into urban centres (Fairlie, 2009).

Similarly to land, water was historically considered a common good. Common-law courts in the 18th century established legal doctrine upholding riparian rights to flowing waters associated with land and property ownership. Although riparian rights applied (pertaining to ownership of the riverbank) the very act of flowing meant that water in rivers could not be possessed in the same way as land (Getzler, 2004). As Scott and Coustalin (1995, p.827) write; "*Carried along with the flow are public rights such as rights of navigation and fishing, and rights to the foreshore, and the government's right of expropriation.*"

In urbanising areas water was being used for industrial purposes, with large-scale abstraction upheld by courts on the principle of 'prior-use' or prior appropriation (Scott and Coustalin, 1995). This did not give the right to ownership of water, but rather the priority right to withdraw it for the purpose of beneficial use. Socially, urban population growth needed piped water supplies for domestic purposes as well as for industry. Victorian industrialists invested in private water infrastructures and, although flowing water was still a common good, the construction of infrastructure and control over resources 'conferred de facto ownership' to industrial elites (Strang, 2016).

Upon industrialisation, large-scale sewer networks began to be constructed in urban areas, with the first major underground sewer network beginning construction in 1859 in London (Cook, 2001). Previously, water provision had been a collective effort and public responsibility, often led by local authorities. Yet, as industrialisation accelerated in the 19th century, local governments became ill-equipped to address the range of water and sanitation complexities emerging, and private companies were often authorised to take on responsibility (Hassan, 1985). By the 1890s water and sanitation access was still not widespread, as developments were "*essentially a market-led process and therefore the increase in access occurred mainly in the affluent boroughs of large cities."* (Abellán 2017, p.11). As access gradually expanded, improved household sanitation revolutionised public health (Middleton and Saunders, 2024). In terms of sewage treatment, it remained common practice to release raw sewage into the sea until the late 20th century, first by boats and later by extended pipe networks (Halliday, 2001).

Public and private governance arrangements varied across the country, as municipalisation developed in an ‘ad hoc’ manner (Hassan, 1985; Lobina and Hall, 2001). However, public ownership of water infrastructures was again becoming more common. In 1907, 81% of water company output was controlled by the municipality (Falkus, 1977). Public ownership enabled action to protect river health, such as the expropriation of land along river banks in Edinburgh, Birmingham and Liverpool (Abellán, 2017). It is evident that since the beginning of industrial water supply and sanitation there have been arguments for the role of private business in improving service provision. Yet, detailed analysis finds that widespread and equitable access, as well as action on environmental protection, required local government leadership (Hassan, 1985).

6.3.2 Embracing private production?

In 1989, a landmark change was enacted when the entire water industry in England and Wales was privatized by Margaret Thatcher’s Conservative government. The main justifications of this decision were: increasing efficiency through competition and improving the financing of large infrastructure investments, arguments re-packaged from ‘pro-business’ governments in previous centuries (Lobina and Hall, 2001). Notably however, the act of privatizing an entire national water and sanitation sector had never previously been conducted, and has not been adopted by any other country since, except Chile with marginal differences (Bakker, 2004). Historically this mirrors the private water supplies of the Victorian era, which were then owned by upper-class Britons, and re-configures them within our globalised world (Strang, 2016). Today, over 70% of the water industry is owned by wealthy foreign investors. (We Own It, 2024).

Since the 1990s, scholars have written on the economics of the privatised industry – how companies accumulate huge volumes of debt by leveraging loans based on the assured revenue stream of captive households (Bayliss et al., 2023; Lobina and Hall, 2001). In, approximately, the last five years, this information has become widespread in the public domain (Bullough, 2022; The Briefing Room, 2024; Led By Donkeys, 2024). Further, since the 1990s, political scholars have continually critiqued regulators for preferentially acting in the interests of private business over those of customers and the environment (Bakker, 2000; Loftus et al., 2016). Most recently, research has found that social factors also affect access to services for certain people (John, 2022; Meehan et al., 2023), the affordability of household bills (Sylvester et al., 2023), and public river rights (Dudley, 2017).

In current public discourse on the water industry, the common language of our waters is regularly employed, for instance, ‘take back our water’ (We Own It, 2024); ‘save our lake’ (Save Windermere Campaign, 2024). This mirrors language from the 15th century regarding common rights to environmental waters. We argue this both reveals the cultural beliefs regarding the

common good approach to water in England, and serves to heighten the group division between large swathes of the public and the water industry. Such divisions became newly entrenched when prison sentences were suggested as appropriate punishment for water company CEOs for the environmental impacts of sewage discharges (United Kingdom Water Industry Research, 2022).

Overall, what we consider or know to be 'water' today in England has been shaped by political decisions and legal, societal, and infrastructural development. The contestation of river and sewer governance has been ongoing since, at least, water supply took the form of an industry in the 15th century (Hassan, 1985). Culturally, people in England have long applied moral and legal arguments to the ownership of flowing waters. This form of hydro-social knowledge is one of the most deeply felt dimensions of opposition to private governance and sewage discharges today. Therefore, we recognise the current issue or iteration of sewage discharges into rivers as a 'conjuncture', defined by Li (2014, p.4) as "*the set of elements, processes, and relations that shape (the phenomenon of interest) at this time and place, and the political challenges that arise*". Informed by this context, the following section details our theoretical approach to data co-creation and analysis, expanding on the key concept of hydro-social knowledge.

6.4 Political ecology and hydro-social theories

Political Ecology (PE) challenges assumptions within mainstream ecological approaches that offer apolitical causes for ecological degradation. For example, the theory that population growth and climate change are direct causes of specific ecological issues. This is challenged by PE scholars, who instead question how these global challenges are exacerbated by trans-national, national, regional, and local political decisions, and how these decisions work to benefit certain human and more-than-human groups over others (Ofori et al., 2021; Robbins, 2019; Selby et al., 2022). Further, the notion that ecological environments are 'natural' is refuted, with scholars emphasising how they have been heavily produced by anthropogenic influence (Acara, 2019; Holifield and Schuelke, 2015). PE illuminates divergent political narratives and social perspectives, which are often marginalised by mainstream discourses.

This is a novel lens to apply to an ecological conjuncture in England, as it developed as an approach to exploring ecological degradation in so-called 'global south' contexts. Robbins (2002) argues that the field remains only partial if it does not engage with global north contexts. The 21st century has seen increasing studies applying PE in Northern America in particular, however fewer exist in Europe (Kojola, 2019; Silver, 2021). PE research is scarce in the England, although there are examples of individual studies exploring fracking and urban forests (Brock, 2020; Kitchen, 2013). Our research is the first to apply PE to the conjuncture of sewer discharges into water bodies in England. Robbins (2002, p.1510) highlights that one aspect missing from environmental

research in global north contexts is "*positional environmental knowledge and practice*". This dimension is a crux of analysis in our study.

The first stage of our PE analysis is synthesising the historical literature to reveal how rivers and sewers have been extensively produced in England over past centuries. Subsequently, we present a range of stakeholder perspectives from our primary data, exploring how they problematise the conjuncture differently. The problematisation approach examines how an issue is conceptualised and configured as a problem within social groups (Stengers, 2021). Research has shown that water management in global north contexts strategically uses problamatising to maintain certain political narratives and hide, disguise, or re-frame alternatives (Müller and Krus, 2021; Weder, 2022). In Sweden, Holmberg and Ideland (2023) find that the 'public secret' of faeces management is upheld through various modes of problematisation, such as discursive silences and simplistic framings. We contribute to this literature by exploring how water and environmental managers problematise this conjuncture in England, and extend it by examining how problematisation occurs amongst activist groups.

We also apply hydro-social theories in order to decipher why actors configure this conjuncture differently. They hydro-social cycle concept was established in Linton and Budds (2014, p.176), which describes this cycle as a "*process by which water and society make and remake each other over space and time*". Below, figure 21 demonstrates how the concept of water is not just the substance itself (H_2O) but rather is the combinations of, and relationships between, the substance, society and infrastructure. We add social texture to this theory by drawing from recent anthropology literature, based in a long tradition of researching water as a relational concept or being (Strang, 2014). Much of this literature derives from indigenous knowledges and worldviews (Nxumalo and Villanueva, 2020; Starblanket and Stark, 2018; Yazzie and Baldy, 2018).

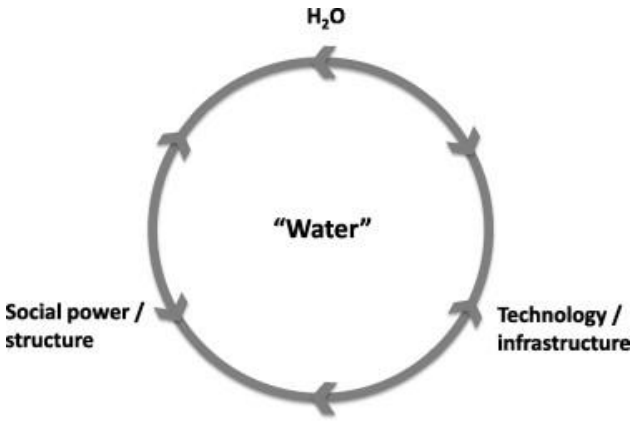

Figure 21: The hydro-social cycle (Linton and Budds, 2014).

Although the hydro-social cycle in Linton and Budds (2014) is based on relationality, it diverges from anthropological approaches to water in the sense that it distinguishes human actions from natural water flows. Krause and Strang (2016) posit that seeing human involvement as a deviation from water's natural state creates the valuing of certain types of water over others. Further, in their anthropology review, Ballestero (2019) find that many of the fluid concepts used to study water have a 'positive moral charge', and argue that this is an ontology to be cautious of as it affects the types of practices and places that are attributed value. Applying morality to certain waters and associated social groups is a dynamic involved in the conjuncture of sewage discharges in England, a discussion thread we develop subsequently.

6.5 Methodology

In this section we detail our methodological approach, including data co-creation methods and positionality reflections. The primary author's doctoral research on water insecurity in England, conducted between 2020 and 2024, noted the rapidly increasing division between the water industry and activists and swathes of the general public. This led to questioning how an acceptable solution can be made possible in such an environment of mistrust and volatility.

PE takes the position that environmental knowledge is political – it is constructed, produced and re-produced (Robbins, 2019). This refutes a positivist outlook which relies on quantifiable knowledge in the pursuit of discoverable, objective truth, but instead aligns with research paradigms that consider knowledge to be subjective. Therefore in this study we took an ethnographic methodological approach, operating within a constructivist research paradigm where knowledge and data are considered to be constructed by the onlooker. Carrying out an ethnography in this paradigm critically highlights the positioning of the researcher, as they interact with interlocutors, contexts, and subject matter to co-create knowledge.

6.5.1 Data co-creation

Ethnography requires extensive familiarisation with the research contexts and interlocutors through observation, relationship building, and participation in local activities, as well as more formalized methods, such as semi-structured interviews. Our research was conducted over a period of 15 months, from September 2022 to December 2023. As such, large amounts of data were co-created, and those included in this paper are only a portion of the overall total. We began by closely following the development of the Nidd Action Group, based in Knaresborough, who

were taking political action to respond to sewage discharges in their local river. Data co-creation activities included: observations at stakeholder meetings and local events, informal conversations, field notes, and reflections from personal river encounters.

We also developed connections with the associated locations of Ilkley and Bradford, at times naturally through snowball sampling interviewees, and at others through intentionally reaching out with the aim of learning about experiences from these interconnected places. We attended local events in both locations, as well as conducting informal conversations and carrying out formal interviews. These three places are shown below in figure 22. They are connected through the groups who are engaged on sewage discharge concerns, as well as through extensive historic relationships as discussed subsequently.

Figure 22: Research locations in Yorkshire: Knaresborough, orange triangle; Ilkley, green; Bradford, purple (original map, OS digimaps 2024).

Ilkley is a centre of the recent water activist movement in England, having received the first inland bathing water designation, in 2020. The two rural towns of Ilkley and Knaresborough exhibit similarities with the rivers Wharfe and Nidd, which visibly flow through them, adding to their picturesque natures. In contrast, the Bradford beck and river Aire are mostly covered and heavily modified, as well as being greatly affected by CSO spills and household misconnections. It is also a much more multi-cultural place than the rural Yorkshire towns. Portraying this, one interviewee discussed the "*Famous little incident, which hit every newspaper in Britain and quite a lot overseas, when we found curry in the in the beck*." (I16)

In addition, the first author carried out 16 in depth, semi-structured interviews with a range of river actors across the three research locations, and beyond in some cases. Interviewees included representatives from: river activists, wild swimmers, the water industry, the environment sector, regulators, politicians and academics. Multiple rounds of thematic analysis were conducted on the qualitative data, to inductively identify categories. The initial core categories identified were: recurring stories; actor perspectives; actor relationships; valuing rivers, with the sub-categories of: (specific) actors, relationships, stories, feelings and attitudes, and activities involving rivers. A subsequent narrative analysis was conducted, finding key themes pertinent to this PE paper, namely; contested river and sewer terrains, dominant and alternative perspectives, and hydroscoial knowledges.

As explained in Sanday's seminal work on the ethnographic paradigm: "*The ethnographer becomes part of the situation being studied*" (Sanday 1979, p.527). This necessitates continual self-reflection to become aware of the assumptions and expectations the researcher brings with them, and subsequent reflexivity to respond to this awareness. We demonstrate our reflection and reflexivity in the following section.

6.5.2 Researchers' positionality

The three authors all live in Yorkshire, and as such have some degree of physical and social proximity to the subject matter of sewage discharges in Yorkshire rivers. The third author went to school in the town of Knaresborough and grew up in a village close to the Nidd as it flows through the Vale of York, and has lived in the Aire Valley and swum in the Wharfe for the last twenty years, and brings a historical, situated perspective to the research. We recognise there is no one 'community' or local relationship with these rivers; they are intertwined in multiple individual and collective dynamic relationships, which are continuously evolving.

The first and second authors have moved to the city of Leeds in recent years from areas in the south of England, due to their research positions at the University of Leeds. Being audibly southern adds a layer of social difference onto interactions with some local people in the research contexts, a layer that has connotations of the 'north-south' divide in England. This was most apparent in interactions with water industry and environment sector representatives, and less noticeable when speaking with activists and academics. There was also a sense of difference when talking with water industry representatives deriving from the culture of the industry, and created by the use of jargon and assumed prior knowledge. Once it became apparent that this knowledge was known to the researcher, interlocutors settled more easily into a sense of familiarity.

We collected and analysed data in an iterative manner, comparing across events and relationships in different research locations, and between accounts from a range of interlocutors and interviewees. This process required continual reflection on our prior, situated knowledge, and our position in relation to the subject matter. One dimension of our situated relationship to the research is that a key entry point to the ethnography was through a member of the Nidd Action Group, who also had links to the University of Leeds. Regarding their own positionality and place in this research, they wrote: "*I went out of my way (a large amount of work and social capital) to make them (events and activities) happen. So they didn't just happen at grassroots level. At Ilkley too, half the residents are University of Leeds academics, so there is a huge resource behind the 'grassroots' campaign - unlikely to be a feature elsewhere*."

Overall, we reflected on multiple dimensions of positionality during this research, and these have been considered during the data analysis and synthesis, presented subsequently. The results included are only a portion of the total results from this study, and a further paper is underway on the specific local dynamics in the town of Knaresborough.

6.6 Case studies in Yorkshire

Throughout England, regional and local dynamics affect the place-based conjunctures of sewage discharges into water bodies. In the South West, surfing and sea swimming are the key issues, in the regional context of proportionally high water bills. In Cumbria, the Save Windermere Campaign has become highly influential in fuelling national outrage, garnering social media support from prominent celebrities and politicians, aiming at United Utilities. The focus in Yorkshire pertains to river health in particular, although discharges on the coastline and in the Humber estuary are also a regional concern. The large cities of Leeds and Bradford, as well as towns in the Yorkshire Dales, are located far from the coast and as such river swimming is widely popular, having increased during Covid-19 lockdowns (Deacon and Allan, 2022).

6.6.1 The regional context

As discussed in the historical literature review, the industrial revolution substantially affected the configurations of water flows in England. In Yorkshire, the Leeds Liverpool canal was built in the late 18th century; a massive feet of engineering connecting the big industrial cities of Yorkshire to the Liverpool docks and, subsequently, America (Canal and River Trust, 2024). Bradford became a centre of the textile industry, for a time known as 'the wool capital of the world' (Lambert, 2024). It gained almost 100,000 residents between 1800 and 1850, and the Bradford beck (a colloquial term for a small river or stream) essentially became an open sewer.

Outbreaks of cholera and typhoid were common: "*only 30% of children born to mill workers reached the age of 15. Life expectancy, of just over 18 years, was one of the lowest in the country*." (Aire Rivers Trust 2015, p.2)

In the 1860s, the city's first sewer and drainage networks were built by the Bradford Corporation (Lambert, 2024). Despite the construction of sewers and treatment plants, the beck became known locally as 'the mucky beck' and the pollution levels in other rivers were measured against it (Aire Rivers Trust, 2015). Around this time, rural Yorkshire became more connected with urban centres, particularly through water and rail. Between 1880 and 1932, the Bradford Corporation was granted permission by the national government to build four reservoirs in Nidderdale, pumping the plentiful waters in the Nidd valley into Bradford and Leeds to support industrial efforts. This had significant effects on downstream mill owners and rural populations in the valley, as well as hugely increasing wastewater flows in the cities (Upper Nidderdale Landscape Partnership, 2023).

The extensive water infrastructures existing today have developed upon these configurations, similarly drawing from rural catchments to supply Yorkshire cities. Human activities have also extensively affected the characteristics of modern rivers, straightening and modifying them though mills and weirs, causing separation from flood plains, faster flows, artificial banks, and reduced wildlife habitats (Field notes, Wild Trout Trust community presentation, 2023). Anthropogenic influence on rivers has been taking place for at least 1000 years for fishing, navigation and industry purposes (Gurnell and Downs, 2021). Geographies of the large Yorkshire rivers are visible in figure 23, with their upper sections located in rural areas and lower sections flowing into urban areas, before finding their final destination in the North Sea via the Humber estuary.

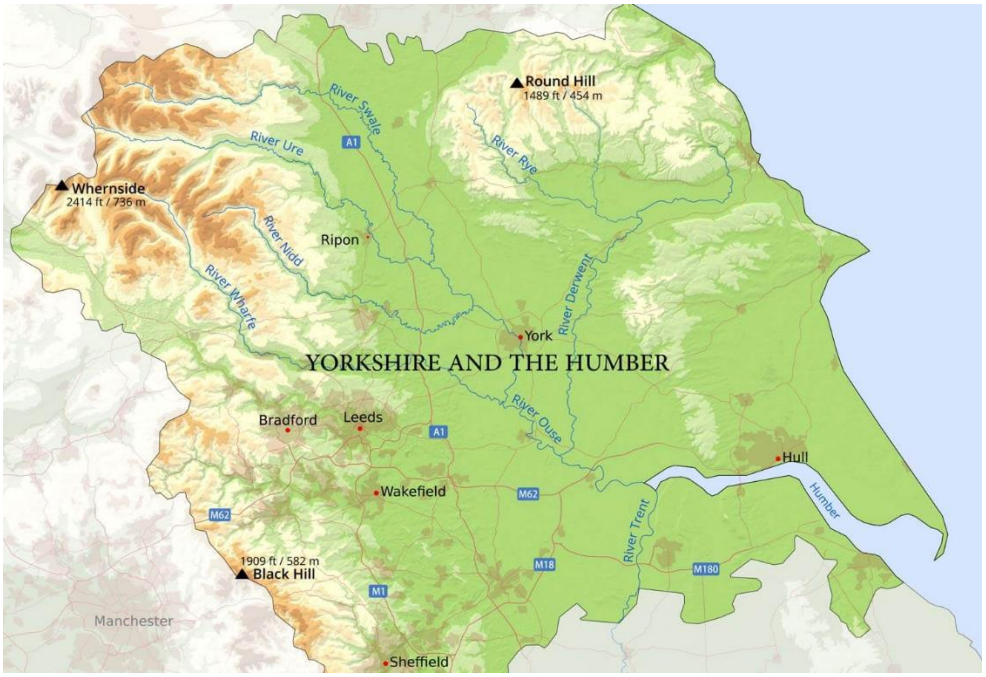

Figure 23: Geographies of the main Yorkshire rivers (free world maps, 2021).

Sewage discharges into rivers in Yorkshire are therefore not a modern phenomenon. Exploring the history of societal configurations and their effects on water flows helps to reveal political dynamics continuing to influence the modern conjuncture. Setting an ecological phenomenon in its wider and historical contexts is the starting point of PE. We use the term conjuncture to represent the issue of interest (sewage discharges into certain water bodies, in our Yorkshire research locations these are rivers and becks), defining it as where the meeting of many factors produces the current materiality (Li, 2014).

Stakeholders in Yorkshire problematise this conjuncture in different ways. Although we interviewed and spoke informally to many different actors, in the subsequent section we focus on three key groups: water industry representatives, environment sector representatives, and river activists and adjacent local people. A number of interlocutors fall into multiple categories, for example, one person may currently be an academic but previously have worked in the environment sector, however we group them based on strongest affiliation most often this is length of time. We include representatives from regulators in the group of their associated sector – environment or water – for anonymity, as numbers of interlocutors from these groups were the smallest and they took on the most risk in participating in the research.

6.6.2 Contested terrains among stakeholders

The reasons for, and impacts of, sewage discharges into rivers in the three locations are the terrains of sewer functionality and river health. These two terrains are problematised differently within stakeholder groups, based on their proximity to sewers and rivers, and the hydro-social knowledge they create. These divergent knowledges develop into narratives within groups, which become intensified when they face opposition and scrutiny from others.

Sewer functionality and river health

In general, activists take the view that sewers are malfunctioning through system failures enabled by neglect, ignorance, over capacity, or deliberate action on the part of water companies. Further blame is often attributed to the failures of regulation, with one activist feeling that water companies are "*a law unto themselves*" due to a lack of EA river monitoring and accountability (I4). Another activist comment was aimed at Yorkshire Water, saying "*you've lied, and Ofwat let you get away with it*" (I5). This problematisation derives from activist hydro-social knowledges, which are commonly created via personal encounters with rivers, through fishing, swimming, regularly observing, and, in the cases of academics turned activists, researching.

Within this set of knowledges (the *knowing* that something bigger is wrong as indicated by experiencing sewage discharges in their local river) key concerns vary among activists. For instance, wild swimmers focus on human health impacts, and can conflate this with wider river health. Fisherfolk are most concerned about species that are the focus of their personal interest. Although some activists do take a broader view to river health than their predominant concern, these individual indicators of interest are contested by water industry and environmental actors, who argue that they do not represent the holistic health of rivers.

Environment sector representatives expressed some concern over the focus on human health within activist and media campaigns, as they felt this diverted attention away from holistic river health. Some felt this highlighted modern anthropogenic centrism in approaches to river management. One interlocutor commented that there needs to be improved "*understanding (about) what human health requirements are, in terms of water quality (in rivers), versus what ecological requirements are… what people (think) are important, that's what gets the attention. Sometimes it frustrates me because we should just care anyway."* (I6)

Other environmental actors faced opposition from activists when they shared knowledge regarding different aspects of river health, including agricultural runoff, off-grid sanitation and industrial inputs. Many accounted being accused of 'getting into bed with water companies' when sharing this in multi-stakeholder meetings (I6; I15; observations). Environment sector

representatives also held a view of past and present societal influence on rivers, discussing how heavily humans have modified rivers throughout history, and how crucial it is to understand how we approach them today. One interviewee asked, "*Do you view rivers as wild … or do you view (them) more as an almost continuation of a farmed managed landscape? You are trying to look after it in the one sense but you're equally trying to use it as a as a resource, you know, and I think I think even in some legislation, there's conflict."* (I10). Another asserted that 'an immense amount of social change' is required to improve river health, because "*people perceive their rivers to be what they think they're meant to be, like with how they've been brought up for generations."* (I6)

In terms of sewer functionality, environmental actors often pointed to legislation and capacity of regulators as problematic. A recurring issue discussed was that water companies were allowed to 'mark their own homework' regarding water quality testing at wastewater treatment plants, as well as a lack of spot-checking from the EA (I6; I16). Water industry actors also referred to regulation as problematic, although not from the perspective of holding them to account, but rather from the perspective of incentivising (or not) changes to practice. The idea that, for water companies, ignorance is better than knowing the extent of sewer discharges, is attributed to failure in regulation. One academic interviewee who had prior experience in the water industry felt, "*their job is to deliver on their regulatory obligations, and if the regulator doesn't require them to know where that CSO is (then) that's fair enough*" (I3)

The water industry in general also takes issue with the activist narrative that sewers are malfunctioning, with many regularly asserting how CSOs are intentionally designed to spill during heavy rainfall, as well as attributing seemingly increasing discharges with new, climate-induced rainfall patterns (I14; I15; observations). While these are impactful factors, others are deliberately not expressed, such as genuine cases of overcapacity and underinvestment. The water industry finds generalisations such as these frustrating, as it hides the nuances and genuine struggles they face, and yet they often follow the same approach, making generalisations about climate change or CSOs operating acceptably.

One water industry interviewee emphasised how CSOs when functioning properly shouldn't have any adverse environmental impact – "*if you've got an overflow and it discharges into the Humber Estuary and it's a small volume, then the impact of that is gonna be absolutely negligible. And so you could have a huge overflow discharging into the estuary, but actually through modelling and through monitoring you can you can show that there is no harm."* (I14) This argument was used to assert how the recent Storm Overflow Discharges Reduction Plan (DEFRA, 2023a) is unhelpful and ill-informed. The narrative that this new legislation is verging on persecutory is informed by

hydro-social knowledge within particular water companies, such as Yorkshire Water, deriving from system expertise and the feeling that their good work goes unacknowledged.

Many in the water industry believe this reduction plan has been too heavily influenced by activists and is not conducive to fair and equitable change within the industry, particularly between companies – "*The other thing to remember as far as the companies is concerned is that that they are some of them in very different positions… United Utilities and Yorkshire (Water) have probably got nearly 2/3 of the entire CSOs in the sector... Others have got relatively few. You have more separated systems in the South because you've had more new development. So you got more combined systems in the North because of, you know, old terraced housing."* (I1). The plan was actively brought up in conversation by all water industry interlocutors. The following sentiment was widely held: "*this latest episode is, in my experience, far and away the least well informed response… that's what politicians do, isn't it? They respond (to) the narrative, rather than necessarily the technical evaluation."* (I15)

This discussion of different problematisations demonstrates some of the deep disagreements between stakeholders over what the problem really is. Activists focus on recent water industry practices, and formulate the problem as an outcome of passive regulatory failure and active pursuit of profit by water companies, over environmental protection. Environment sector representatives centre river health from a holistic and historic perspective, and similarly acknowledge poor regulation but attribute this to cuts in state government funding and weak legislation. They consider sewage discharges to be part of a bigger problem, where the public do not acknowledge or understand their holistic impact on the natural environment. Most water industry representatives see the problem of sewage discharges as resulting from climate change rainfall patterns, and inherited combined sewer design which they do not have capacity or mobilisable funding to substantively re-build. They are also very reactive to the probelmatisation of activists, which has gained substantial media traction, and they feel portrays them unfairly.

With the root problem being so highly contested, there is majorly disjointed progress being made towards sanitary reform. The solutions presented by stakeholders are themselves divergent, with the environment representatives wanting to move towards holistic river health and nature-based solutions, water sector representatives desiring greater public trust to allow them to work through their expert, although private, priority investment lists, and activists seeking to influence strong regulations to restrict the ability of water companies to neglect sanitation infrastructures.

6.6.3 Dominant activist voices

Previously, we discussed how priority concerns vary among activists, specifically contested indicators of river health and sewer functionality. However, further divergences of interest and influence exist within this stakeholder group and the communities they are a part of, despite a single narrative being portrayed in the media. This dominant activist narrative derives from rural, middle-class hydro-social knowledges, which are particularly evident in our research in Ilkley. The Ilkley Clean River Group, along with the Windrush Against Sewage Pollution in Oxfordshire, were the two early activist groups that sparked the recent wave of activism and set the tone for widespread public narratives. We go on to contrast this with alternative hydro-social knowledges from our research in Bradford.

Ilkley

The origins of Ilkley's campaign and bathing water application are attributed to anglers noticing sewage being discharged into the Wharfe, and some wild swimmers becoming sick, which caused a few local people to take it to the EA. One person from Ilkley explained that the EA had responded to them, saying *"(It's) not an issue, this is, being discharged under permit… Pretty much go away, basically.*" (I12). A group was subsequently formed, consisting of environmentalists, academics, councillors, and committee members of other local organisations. Many of these 'outspoken' people were women, and one remembered, "*We were laughing at one stage because the way they (Yorkshire Water) go, they don't want to do anything until we're (in our) 80s… So we're just going to have to go and chain ourselves to the sewage works… A suffragette, but like a water suffragette.*" (I5) One water industry representative discussed these early interactions with Ilkley activists, expressing that "*There was one individual who was very vociferous, very clever, and managed to drive lots of support one way or another… they actually upset quite a lot of people*" (I15).

The Ilkley group define their pioneering work in their own words, writing "*Ilkley Clean River Group, are the first campaign group nationally to secure local infrastructure to radically reduce water company sewage pollution, by holding regulators, water companies and politicians to account using data, public outrage, policy, and the media*." (Eventbrite, 2024). Key to their success is the resources, social capital, and political influence they hold, as well as the river Wharfe's characteristics – being relatively clean and accessible enough already for swimming. However, they assert that other groups can follow the Ilkley model to improve the health of their local river. This assertion both flattens the contours of privilege and capacity, as well as re-produces the narrative that this is *the* way to do activism and make change on this issue.

This narrative has been highly influential, and the Ilkley group has undoubtedly caused the most externally-driven impact on the water industry in decades. This has sparked other local groups to look into bathing water application, and many have been directly facilitated by the Ilkley group and Surfers Against Sewage to do so, with the latter organisation setting a target of 200 bathing waters by 2023 (Surfers Against Sewage, 2022). The Nidd Action Group in Knaresborough has been one to successfully follow this model, being granted their designation in spring 2024, alongside 26 other sites across the country. These are record breaking numbers of new sites, following an upward trend in recent years. Ilkley was the first activist-initiated application then, in 2022 two more were granted, in 2023 four more, and 2024 saw 27 new sites (Davies, 2023; DEFRA, 2024; DEFRA, 2023b).

In our conversations with interlocutors, Ilkley was referred to often and many attributed the huge rise in the profile of sewage discharges to them. An environmental actor called their campaign for bathing water status an 'absolute catalyst' for increasing the attention from the Yorkshire environment and water sectors, emphasising that "*not everyone appreciates how much response and reaction the Environment Agency and Yorkshire Water had to do*" (I6). In our research, it quickly became apparent that Ilkley's bathing water application was highly contentious within the water industry and regulators, both at the time and currently. The following quote summarises this sentiment: "*what it's done is it distorted Yorkshire Water's spending priorities. I think it is £80 million they're throwing at Ilkley. I can think of much, much better places to spend £80 million. Places that would have a much greater impact on water quality and on public perception.*" (I15)

Bradford

In response to a question about the increasing popularity of bathing water applications as a strategy for securing local investment, a Bradford activist replied "*Well, all power to them… it was a really clever move by the group in Ilkley. I just, I wish I'd thought of it, but that didn't apply*." (I16). River groups in Bradford exist quite differently to those in Ilkley and Knaresborough: interest is lower, proportional to the local population, and attendance more irregular. Some reasons interlocutors proposed for this were, the myriad other priorities local people have, as well as the lack of visibility of the urban river Aire and the Bradford beck. The beck is heavily modified and, as such, very few people have opportunity to engage with it through activities like swimming, fishing or walking alongside.

Comparatively, sewer discharges and other anthropogenic inputs are higher than those in Ilkley or Knaresborough, and have different urban characteristics: "*There are 52 CSOs in Bradford in which is a very small area, and misconnections…that's a perennial problem… sewer related*

problems (are) much more difficult for us to investigate… because it's covered." (I16) While CSOs have a greater prevalence in cities, issues such as misconnections and road runoff are also common, whereas in rural Ilkley and Knaresborough agricultural runoff is the main input alongside sewage discharges. Essentially, urban rivers are not remotely clean enough for people to swim in, which is a requirement for applying for bathing designation. Beyond it not being feasible, one interlocutor described how they thought it was not a good way to create change, as it antagonised water companies, working against them rather with them (I15).

A number of people from the environment sector discussed working *with* water companies, some suggesting that rural activists were unhappy with their place low down on the investment priority list – "*the way for them to jump up that list is to do what they're doing.*" (I6). However, this priority list was often discussed in abstract terms, but the reality in Bradford (an area with all the characteristics of being high-priority) was that people had not seen evidence of proactive investment or monitoring. One interlocutor explained how a river group they are part of had to take 2000 photos over a 12 month period before Yorkshire Water would come and fix 50 local sewer misconnections. Additionally, they discussed a recent £1.6 million fine Yorkshire Water received from the EA due to a malfunctioning CSO (EA, 2024b), which they said the company had known about for a while but chose not to report; "*if we hadn't happened to be there trying to take a sample for something, it would have gone on for another year or so*." (I16).

In summer 2023, the Bradford beck festival was hosted by local activists and river and culture enthusiasts from the area. It showcased the old and new hydro-social relationships in the city, from making artwork of bog monsters and creatures from folklore, to Arabic calligraphy classes, and splashing around on a tarpaulin throwing cloth fish into water buckets. Conversely, 45 minutes away in Ilkley, an upcoming event in autumn 2024 is amassing sewage activist celebrities, influencers and professors. The scale, reach, political profile and national influence of this event represents and re-asserts the dominant activist narrative which, for much of the general public, appears to be the only one.

"Communities"

The dominant problematisation of this conjuncture reportedly took a 'blow' shortly after the 27 new bathing waters were designated, with DEFRA suspending any further applications until at least spring 2025 (Laville, 2024). An influential environmental organisation, Thames21, commented that the new designations showed that DEFRA 'have acknowledged communities' concerns' regarding water quality, but called the pause on applications 'incredibly frustrating' (Donnelly, 2024). The term 'communities' is widely used in activist and media discourse, and yet there is rarely clarity on who exactly is being referred to.

Multiple interlocutors discussed the local nuances within the three study locations in Yorkshire. In Knaresborough, in the middle stage of their campaign, the Nidd Action Group became affiliated with the local Conservative MP's office, a move which cause splintering of the group and led to some members leaving. The smaller group who splintered expressed their dissatisfaction when results from river testing showed elevated levels of E.coli, and they were pushing for these to be released widely before the local bed-racing event. Similarly, one interlocutor commented about differences within the Ilkley group: "*I strongly suspect that if you'd asked some of the others involved around that they might not have held the same view as (one particular leader) did, but they was persistent and, credit to them, became successful as a lobbyist*" (I15)

We also heard how some people in Knaresborough and Ilkley were disengaged from their local campaign because the leaders were known to take up political causes and campaigns regularly. This caused some to comment on the drivers behind this, with one academic expressing (strongly) a fairly common sentiment: "*I think a lot of people who've got into this are retired and they're looking for something to do, and they want something that gives them some sort of status… I think it comes down to psychology. I think what they're trying to achieve for rivers is actually secondary to it being about them.*" (I11) Other local people were reportedly disengaged and upset about the raised profile of sewer discharges in the Wharfe and the Nidd, feeling it would ruin the reputation of their picturesque towns, and potentially affect their house prices and water bills (I12; I13).

Further, in Ilkley, there is evidence of discrimination against Traveller groups who periodically reside by the river Wharfe (Sewell, 2022; observations). A limitation of our study was to include the direct voices of disengaged and marginalized groups. However, we are aware from existing research that the discrimination against Traveller groups is a pervasive practice in England (John, 2022), and in this case it represents the exclusionary nature of certain hydro-social knowledges. Another indicator of community divergence is the Public Space Protection Order which has been in place on Ilkley riverside since 2021, permitting fines for people deemed to be carrying out anti-social behaviour. In June 2024, Bradford council announced that the order would not be renewed, and a local councillor responded saying "*This is a step backwards and appears to be more about cost-cutting than doing what is right for Ilkley.*" (Laver, 2024: np) This reveals the position of the river as a contested public space, where certain groups of people are considered to belong and others are not.

Lastly, a future direction of dominant activism is the financing of sewer infrastructure investments. One water company representative explained, "*I can't talk about specific numbers, but what I can say is that you know United Utilities and ourselves (Yorkshire Water) will have significant what's called enhancement programs of work. Which is essentially money that*

ultimately is charged to customers based on new regulations." (I14) In this conversation, the new regulations being referred to were the activist-influenced Storm Overflow Discharges Reduction Plan. A concern many interlocutors raised was that residents of Yorkshire living outside of locations receiving sewer upgrades, and those on low-incomes, would have no choice but to contribute to their financing. We contest that this is inevitable, as expressed by water industry representatives, but rather it is a function of the exiting water industry governance model. However, it likely will occur in the near future if governance arrangements remain unchanged. We argue that, although dominant activists have so far been able to maximise loopholes and secure special treatment, it remains to be seen whether structural change, supporting greater regional equity, will occur.

6.7 Conclusions

The present-day conjuncture of sewage discharges into water bodies is presented in dominant discourse as being; emblematic of England's broken public services and, a distinct case of morally-good activists opposing morally-corrupt water companies. Its causation is attributed to privatisation of the water industry in 1989, and the resulting decline in infrastructural investment and deliberate pollution of the environment in the pursuit of profit. In this paper, we have demonstrated how a Political Ecology analysis of this conjuncture reveals further nuances and contestation within its dominant conception.

Drawing from the historical literature, we establish that the production of England's rivers and sewers has been a continual process evolving over centuries. The repetitive cycle of; political attraction to private investment as a way to raise finance, to public opposition sparked by resulting social and economic inequity, to some degree of re-nationalisation, is as old as the water industry itself. Further, societal configurations have similarly long affected access to water and sanitation services, as discussed regarding the re-direction of Yorkshire's fresh and waste water flows during the industrial revolution. This history establishes the background of the modern conjuncture's contours and contestations.

Ethnographic exploration unpacks the complex narratives and perspectives on this modern conjuncture in Yorkshire, through gathering different stakeholder perspectives and interactions. This led to further investigation of the alternative and unheard perspectives from those within activist groups and other local people in our case study locations. We demonstrate how the conjuncture is problematised differently by stakeholders, based on resonant hydro-social knowledges created individually and re-produced within their group. The contested terrains of river health and sewer functionality reveal some of these divergent problematisations. Opposing

narratives become intensified and antagonistic when they are expressed in politically hostile, knowledge sharing environments and media reporting.

Comparison across three regional locations highlights which activist narratives are dominant and which are marginalized. In particular, the strategy of bathing water designation emphasises which groups and places are able to benefit from the mainstream narratives and which are not. Insights from river activists and enthusiasts in Bradford reveals their focus on place-based knowledges and outreach, despite the poorer health of their rivers and less attention from Yorkshire Water and the EA, compared to Ilkley in particular. Alternative perspectives from local people in Ilkley reveal that the dominant voices in sewage activism are also the dominant voices on a host of local issues, and are not universally supported.

Hydro-social theories and anthropology literature posit that human involvement in 'water' is not a deviation from its natural form, an assertion we support through our historical analysis of society-water configurations in England. Water is continually produced and re-produced though social interactions as well as H_2O flows. The modern conjuncture of sewage discharges into water bodies offers insight into the production of water in society in England via hydro-social knowledge, between 2017 and 2024, and suggests how we might *know* water as a society into the future. Our research demonstrates how easily and pervasively morality is associated with water flows, and shows how this can work to marginalize certain other perspectives and experiences, as well as creating animosity between 'stakeholder groups', or simply, between the humans within them.

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Chapter 7

‘Why, in order to try and get the river cleaner, do we have to go through all this?’ Searching for New Water Justice in Knaresborough

The previous chapter used a political ecology analysis to situate the current issue of sewage discharges in its historical social, ecological, and infrastructural contexts. This foundation enables further research with NWJMs in E&W. The fourth paper from my research is presented in this chapter, following on from the previous paper. As it derives from the same study, it is also based on ethnographic data from Yorkshire, but focuses in on the town of Knaresborough and explores the local dynamics involved in water activism in this place. This paper is in preparation for journal submission.

Moving from political ecology to ‘new water justice’, the theory in this paper begins to explore water justice concepts, as this is the basis for the term NWJM. It asks what new water justice means in a particular place when it is enacted via existing social structures and relationships. Interestingly, it echoes some of the findings from paper two with canal boaters, as both look into intra-group dynamics. Divergent perspectives and goals emerge, and many voices remain hidden through choice or through lack of platform. This leads to questioning what place-based new water justice means both in theory and in practice, and how developments in this area can contribute to greater water security for all.

7.1 Abstract

Activist struggles for water justice have become part of the cultural zeitgeist in England over the last 5 years. The public profile of sewage pollution has risen exponentially since water quality monitoring and Combined Sewer Overflow data became widely available in 2021. Campaigns have developed around this contentious issue, and are conceptualised in this article as New Water Justice Movements, a term coined in recent Political Ecology literature based on the desires, observed globally, of people re-turning to more reciprocal relationships with water.

This study documents a local movement in the town of Knaresborough in Yorkshire, employing an ethnographic approach over the course of 15 months. This case reveals placed-based relationships between local residents and the river Nidd, as well as community and stakeholder dynamics affecting water justice pursuits. We situate this story in its regional and national contexts. The popular notion that a single binary exists between river ‘polluters’ and ‘defenders’

is refuted, by acknowledging diverse, and potentially divergent, types of water justices being envisioned by different people.

We apply the emergent theory of NWJMs in this specific case, exploring how water justice theory becomes shaped by the social structures and relationships already existing in a particular place. The politics of activism are contentious, even when from the outside it appears that the dominant group represents a majority of local interests. Water activism is particularly challenging in England, given the secretive and highly complex nature of water governance, and this creates an environment where activism and participation are at high risk of being instrumentalised.

Figure 24: Graphical abstract depicting the town of Knaresborough as drawn by a local artist and river activist.

7.2 Introduction

Sewage spills: a marker of injustice?

Sewage spilling via combined sewer overflows (CSOs) has become one of the most prominent issues of public interest in England, sparked by a new wave of activism in the late 2010s. Passionate river activists in Oxfordshire and Yorkshire spearheaded this movement, who, by the 2020s, began to organise collectively and collaborate with larger organisations such as Surfers Against Sewage. Adding to their momentum was new legislation in 2021 requiring the Environment Agency to publish event duration monitoring (EDM) data, showing the number of hours CSOs discharge per year across the country (Environment Agency, 2024). This publically

available data provides an evidence base for activist claims, which often derive from personal experiences of recreation in local waters.

Shared outrage over sewage discharges is a uniting force. Wild swimmers are an influential activist group, who have joined forces with others, including anglers, surfers, kayakers and ramblers. The concerns of related movements, such as the right to roam campaign, also overlap with those of water activists, all of whom assert their rights to exist, interact and participate in the rural environment. Further, many have experienced personal encounters with sewage discharges, and not only the disgust that comes with it, but also the health risk. Stories and data of children and adults falling ill after entering rivers, lakes and seas has increased, although some question whether this is a product of greater numbers of people interacting with environmental waters (Horton, 2024).

Sewage discharges have been politically positioned to symbolise a 'failing' national water sector. The governance of water resources and services has come under intense scrutiny in the last few years, bringing new attention to an enlightening body of work conducted by scholars on the practice of financialization (Bayliss, 2016; Loftus and March, 2019). The complex financial operations of the water industry in England are impenetrable to most, but they have been revealed by political economists, and shown to be commodifying household customers (as streams of assured revenue) as well as water itself (Loftus et al. 2019). Ahlers and Merme (2016, p.766) call this type of profiteering a "*deeply undemocratic process with potentially highly uneven impacts on social-ecological landscapes*".

The volatile combination of environmental degradation, public health risk, and financial exploitation has spurred vocal water activists, who have greatly impacted both public perceptions of water and legislation governing it (Department for Environment, Food & Rural Affairs (DEFRA), 2023). Although there has been a national increase in awareness and action, most activists are organised in a place-based manner, and rooted around a local river or beck. There are undoubtedly mainstream narratives amplified and positioned as being the singular activist beliefs in England, supported by influential celebrities and professors. This is discussed in our previous paper (Sylvester et al., 2024). While their influence is extensive, we argue that place-based interests and dynamics are divergent and at times contradictory.

This paper focuses on a group of local activists in the town of Knaresborough, North Yorkshire, and the interests and relational dynamics in this place. We consider the new wave of activism in England to fit the term New Water Justice Movements, and we highlight the plurality of this term when describing the national picture. Our study follows one of the many unique, local movements across the country.

7.3 Theoretical basis

New water justice activists

The term New Water Justice Movements (NWJMs) was coined by Boelens et al. (2023), who emphasise that the terms ‘new’ and ‘movement’ are questions rather than assertions. As mentioned previously, the landscape of water activism in England has exploded in recent years, making it an opportune case for exploration. Powerful activists have presented a singular narrative to the general public and politicians, effectively influencing change but obscuring the complexity of this issue, as discussed in Sylvester et al. (2024). In this previous paper we attribute the diversity of activist experiences to hydro-social relationships and how these are inherently place-based, often mirroring the societal configurations of local and regional geographies.

This successive paper is based on ethnographic data co-created in Knaresborough, and aims to represent a portion of the story of the river activism in the town. Although NWJMs are diverse, they are unified by a sense of injustice over the exploitation of local waters, engaging in “*radical collective practices of place and community making, wresting rivers away from influences that enclose, commodify or pollute*” (Boelens et al., 2023, p.1127). Further, Boelens et al. (2023) suggest that NWJMs ‘think in terms of Riverhood’, a term that denotes a unifying process of becoming the river or coming into relationship with it. Similar terms have been coined simultaneously in the literature, notably Riverkin by Cohen et al. (2023) and kinship as ‘living kindness’ by Strang (2023).

All such concepts seek to express the seemingly growing desire among humans around the world to re-turn to more reciprocal and convivial relationships with environmental waters. The point of desire is important here, as human desire can spark passionate action that faces obstacles in the structures of society and water governance when put into practice. Further it faces contestations by different groups of people who may have alternative experiences and visions for the future. Boelens et al.’s (2023) concept of Riverhood seeks to consider how rivers are ‘imagined, produced, and lived’, a process which reveals inherent disparities and contestations between human experiences.

Such contestations are highlighted by water justice activism, particularly in local contexts. This can be situated in existing literature on environmental activism, which considers the social, behavioural and psychological nature of activism. Mihaylov and Perkins (2015) discuss the evolution of environmental activism, and express how the most recent ‘environmental justice movement’ has distinct characteristics of localism. Bringing together research on social movements and place with environmental psychology, they comment that people’s emotions often derive from a threat or perceived threat to their place-based behaviours. They also highlight the importance of ‘meaning-making’ and social capital at the local level.

Hommes et al. (2023, p.3) emphasise the need to study and engage with NWJMs, given their rapidly growing influence worldwide in regional and national water governance. They write how the aim of this is not "*to look for universally true 'best practices' to be scaled-up or replicated, but rather to learn about, map and support diversity in riverine defence and reviving practices*." In this study, we represent a portion of the story of the river Nidd in Knaresborough and the people who share their lives with it, who are seeking justice for it (and for themselves).

An overview of water justice

Given that NWJM terminology is premised on water justice, here we overview this concept. Recent research on water poverty in Scotland defines water justice as "*the fair distribution of water underpinned by a recognition of diverse water needs*" (Anderson et al., 2023: 3). This accounts for both distribution and recognition, two key strands of justice literature which together facilitate comprehension of the broadness and complexity of 'justice'.

Water justice derives from environmental justice scholarship, a tradition based on the premise that environmental degradation is distributed in an unequal manner, and further marginalises groups already on the economic or political margins (McLean, 2007). This perspective on justice focuses on processes of distribution. It asks – to whom are the benefits and burdens of human development allocated, and, how can re-allocation be conducted to produce fair distribution (Joy et al. 2014)? Regarding water justice specifically, distributional research focuses on issues such as drinking water pollution (Butler et al. 2016), water scarcity and access (Ioris, 2017; Udas et al. 2014) environmental water pollution (Ruppen and Brugger, 2022), and water abstraction (Kulkarni and Shankar, 2014). While this remains a foundational strand of justice, Schlosberg (2004) theorised another strand, that of recognition.

According to McLean (2007: 27), recognitional justice 'embraces a politics of difference' and recognises a diversity of knowledges and experiences within affected groups. Schlosberg (2004) argues that issues such as cultural identity and democratic rights should be included in understandings of justice. He goes on to emphasise that demands from civil society often challenge mainstream notions of economic development, as well as academic notions of what justice means from the viewpoint of universities. Anderson et al. (2023) discuss how, in Scotland, recognitional justice requires interacting and engaging with different people in order to account for needs which arise from 'different circumstances and cultures'. Therefore, water justice scholarship encompasses distribution and recognition, and emphasises that the latter requires diverse participation.

There are some debates surround the ultimate goal of justice. Notably, seminal scholars Zwarteveena and Boelens (2014) contest the neoliberal aim of individual freedom, arguing that widespread injustices can be compatible with this goal when based on people's own strivings, for instance, in the free market. In agreement with Schlosberg (2004), they write that "*definitions and understandings of justice cannot be based only on abstract notions of 'what should be', but also need to be anchored in how injustices are experienced*" (Zwarteveena and Boelens, 2014, p.147). In our research in England, we find that there is a growing disconnect between national notions of 'what should be' and local experiences of water injustice. This unfolding process is and interesting example of the dynamics of a new water governance based increasingly on the influence of certain NWJMs.

While NWJM literature focuses on the defence of clean river water, sewage spills are themselves a type of water, and do not necessarily cause harm if discharged very rarely and at a high dilution, as the combined sewer design intends. This has become an issue of justice in Knaresborough because the regularity of spills is damaging the eco-system in the river and raising questions over the integrity of water companies' financial practices, regarding customer billing and infrastructure investment. The river environment, and the people who interact with it, experience the unequal distribution of polluted waters (sewage) and carry the associated burden through declining non-human and potentially human health.

Water justice scholars emphasise that experiences are situated, rooted in place and history (Anderson et al. 2023; Ioris, 2017). Although the campaign in Knaresborough follows in the footsteps of other river activist groups in England, particularly through its focus on applying for bathing water designation, the town's community dynamics remain central to its unique riverine defence and reviving practices. The following section sets out the methodology of our study, before going on to recount part of the story of the Nidd Action Group (NAG) in Knaresborough. In this account, dynamics of local interest, relationships and decision-making are exemplified, to show a diversity of perceptions of water justice (as a goal) and how it should be achieved. The concluding sections recall this theoretical scholarship to suggest how understandings of water justice can be developed.

7.4 Methodology

Research context

The research was conducted in Knaresborough, North Yorkshire. This picturesque town is built around a defensive rocky outcrop, beside the river Nidd gorge. From its castle there is a view for miles out over old crown lands. The castle dates back to the Norman period, occupied by the

aristocracy for over 5 centuries until the English civil war when it was mostly destroyed as a royalist stronghold (North Yorkshire Council, 2024). Another historic landmark is Old Mother Shipton's cave, host to a petrifying well and a history of the legendary woman with powers to predict future events, most notably the plague and the great fire of London (Johnson, 2024).

The river Nidd itself is a defining feature of the town, flowing under the impressive railway viaduct and through the dramatic gorge. It rises at the Nidd Head spring in the Yorkshire Dales National Park, flowing down the slopes of the Great Whernside peak, and weaving through the Nidderdale National Landscape. Flowing through four reservoirs which feed nearby cities, and the historic town of Pateley Bridge, the river arrives at Nun Monkton after 56 miles (Yorkshire Dales Rivers Trust, 2023; Environment Agency, 2023a; 2023b). Its name has been linked to various descriptions and meanings, including brilliant, shining and dark – dark may relate to its peaty colour and cave systems in the upper sections (Yorkshire Dales Rivers Trust, 2023; I6).

Figure 25: River Nidd length (WF, 2024).

Today the town is home to about 15,000 people and, although it is connected to nearby cities on the train line, it has a quiet, rural feel. On warm days it is popular with tourists, and much of the attraction is to experiencing its historic attractions and taking a walk or a swim in the river. Boating is common around the viaduct, and swimmers gather at spots by the lido and Conyngham hall. Keen local residents swim almost all year round, and there are a number of angling groups with a strong interest in the river's ecology.

Research approach

Over a period of 15 months, September 2022 to December 2023, I (the first author) spent time familiarising myself with Knaresborough through participating in local events, learning about the town's history and geography, and building relationships with residents engaged in river activism. This was part of a wider research project exploring regional dynamics of sewage discharges and water activism in Yorkshire (see, Sylvester et al., 2024). Our first paper focused on the two other research locations in Yorkshire (Bradford and Ilkley), and avoided discussing in detail the case of Knaresborough, in order to allow deeper exploration in this subsequent article.

Data co-creation activities included: attending stakeholder and community meetings (in one, documenting community perspectives in a participatory manner, with the visual aid of the poster presented in figure 26), conducting 16 in-depth semi-structured interviews, and ethnographic data collection via observations, informal conversations, 'field' notes, and reflections from personal encounters with the river Nidd. Once compiled, documents accounting these interactions were thematically analysed in the following categories: recurring stories; actor perspectives; actor relationships; valuing rivers. Sub-codes differentiated between places and activist groups engaged with, and for this article the data from Knaresborough was draw from.

Researcher positionality was of high importance in this research, particularly given the ethnographic approach. This is detailed in Sylvester et al. (2024). Key to highlight for this study is the nature of key individuals who provided entry points to the river activism taking place in Knaresborough. Such people were integral to allowing this research to take place and for facilitating the outsider to partially see inside this activist group and life in Knaresborough. Another aspect to highlight is the third author's proximity to the research context though growing up in the town.

Figure 26: Poster displayed at a local event to spark conversation and response.

7.5 Results

7.5.1 The town by the river

Visitors and residents of Knaresborough have interacted with the river for generations, by walking or running beside it, to boating, fishing, farming and swimming. There is also a bed-race that has taken place every summer since 1966 in which teams of competitive athletes run 2.4 miles through the town, including crossing through the river, pushing a bed with wheels and a person in it. Further, a wild swimmer from the area recounted that children used to learn to swim in a sheltered stretch; "*I've got two sets of neighbours who've said to us that before the swimming pool was built in the town, which was probably about 30 or 40 years ago now… they used to use the Lido at Knaresborough for swimming lessons for children. So quite a lot of the people who live locally, they actually learn to swim in the river*." (I13). Below, figure 27 presents ways different people interact with the river in their own words.

Figure 27: Responses (as written) about people's interactions with the river, from attendees at a nag event in Knaresborough about river pollution and bathing water status.

As well as being a place of personal enjoyment and connection, the river is visually a central and defining feature of the local landscape. One of the political actors involved in the NAG campaign described it as the 'heart of the town' for many people. They went on to discuss how the visual image has become a way of thinking about the town; "*So I think that's why it's important is because it's the poster and you know [when] everyone thinks of Knaresborough they think of the Nidd and the viaduct.*" (I2) Key to this image is the viaduct, a human-made construction connected to the river.

While to many the Nidd appears as a wild and natural entity, there has in fact been extensive anthropogenic influence on its shape and functioning. In particular, weirs and straightening have caused separation from flood plains, faster flows, artificial banks, and reduced habitats (Community event presentation by the Wild Trout Trust, 5th Dec 2023). Yet, additions such as weirs can cause places of slow moving water, enabling people to swim in safety. Many people we engaged with in this research emphasised the importance of the river Nidd to them personally and the town as they know it.

7.5.2 Action group forming

Members of the NAG recounted how the group begun in 2022 after anglers began to notice more regular signs of pollution and ecological change. The Nidd Catchment Anglers Group has 7 fishing clubs, and joint concerns created a premise for them to meet together. Such meetings were, in some ways, unexpected as one member described; "*Fishing clubs often are rather insular things. You know, people go there to be alone by the River and to catch fish, not to talk to their fellow human beings very much and let alone other club members.*" (I4) Four anglers in particular began to meet more frequently, and soon some local councillors also starting attending these meetings. The group began to gain interest from the public, politicians and organisations before they had a formal nucleus established.

Relatively early on in the group formation, they invited a representative from Yorkshire Water to join one of their meetings, but felt they had been unhelpful and had not answered their questions

on river pollution. One described this as "*a really bad experience of not being listened to*" (I7). After this, the representative did not attend subsequent meetings, and subsequently left their post. At this stage, NAG was left without any confidence that Yorkshire Water would respond to their concerns without applying for and being granted bathing water designation for the Nidd. Subsequently, more effort was put into connecting with other local activists and the University of Leeds to support action. University involvement was able to unlock funding, provide support for sampling, and offer laboratory access.

Around this time, in autumn 2022, NAG developed 3 strands of work it planned to undertake – campaign publicity and community engagement, water quality testing, and bathing water application. They asked for members and other actors (such as those from local environmental organisations) to support one of these strands. The university partnership supported on publicity and sampling, alongside other local activists in Yorkshire, particularly those from the pioneering Ilkley Clean River Group, which were the first citizen group to receive bathing water designation of an inland water body in England. Advice from Ilkley regarding sampling and overall campaign strategy was shared with NAG, taking the approach – "*you've got to kind of decide what it is you're trying to achieve, and you've got to be a bit single minded about it*." (I5) This is very much the mode of operation of the Ilkley group, and worked successfully for them in terms of achieving the goals of public awareness and bathing water designation.

7.5.3 Political tensions

Tensions within NAG intensified upon the increasing involvement of the local MP. While group members held different political affiliations from the outset, these became heightened during discussions in late 2022 about whether to allow the Politian to take a central role in the campaign. Some NAG members were affiliated with smaller, more progressive political parties including the Green party, and the MP was a centre-right Conservative party member. While they were all seemingly taking up the same cause of a cleaner river, trust in the MP was low among many people both because of their poor environmental voting record in parliament, and a general low trust of the sitting Conservative government.

Despite reservations of many in the group, its small leadership decided it would be pragmatic to form a partnership. The MP's office expressed interest in taking on the responsibility for producing the bathing water application in late 2022. One member of NAG recounted their reaction to this – "*I was somewhat surprised when [the local MP] grabbed the whole thing of bathing water initiative. I shouldn't be really, but because we're such an informal group and haven't got formal roles or funds, I was very grateful that he did. But it does have side effects because there's lots of other political views in town.*" (I4). NAG's leadership emphasised that the

main reason for letting the MP's office take on the job of writing the application was the time and energy requirements. They felt that without them, NAG did not have the capacity to do so.

However, some campaign members and interested local residents were unhappy with this arrangement. One core member of the group described this in the following way "*there's members of the community that feel like that is not an ideal situation, particularly because we don't even know what they're going to put into the application or if they're going to and do a good job…*" (I7). This demonstrates the lack of trust in the Politian's involvement. Although justified in terms of the group's low capacity, the reverberations of this decision by NAG's leaders was disrupted social affiliations (existing friendships) among group members, interested residents, and local councillors who represented other parties.

Suspicion over the agenda of the MP was rather extensive throughout the Knaresborough residents who were interested in this issue, many of whom were critical of previous voting record of the MP against environmental protection policies. One older gentleman printed this voting record and read it out to the MP's representative at an event in March 2023. The MP themselves did not attend. Despite the ripples of suspicion, the majority of core NAG members decided the trade-off was worth it for the benefit of the MP's office carrying out the (somewhat tedious and highly involved) work of writing up a bathing water application.

The March event was held by NAG to showcase their early strategic plans for river sampling activities and bathing water application. This event also served their third strand of work on campaign publicity and community engagement. In essence, this strand was part of the bathing water application, as for it to be viable it must have a majority of local support. According to organisers of the event, compared to local events for other causes, attendance was exceptional. Indeed, the room it was held in in the local church was full, with people sitting and standing, talking with one another and expressing their concerns to the speakers. Many of these concerns about pollution and the public health implications of sewage discharges were captured in a participatory activity, with the written responses shown below in figure 28.

The demographic of attendees were majority middle- and older- aged, white residents of Knaresborough, many of whom explained that they had lived there for years or decades. Many were also politically engaged, and expressed a mix of curiosity, concern and suspicion over the involvement of the local conservative (at the time) Member of Parliament (MP).

Do you want to see something change (with the River, as it is now)?

- Yes clean water for life, for all.
- 1. Yes – return all water companies to public ownership
- 2. Water management/house engineering to be a mandatory part of national curriculum
- Yes! – a clean River!
- Yes – because after swallowing a small amount I was very ill for 2-3 months so I would like to be able to swim and not worry about getting ill
- Yes because after being underwater I was ill for a day
- Yes – see clear water not brown with scum
- Yes toxic levels of sewage reduced so people don't get ill – BATHING WATER STATUS
- Yes – the River usually looks very murky & turbid
- More access to Riverside for walking and boat launching
- To ensure Yorkshire water meet their statutory obligations in terms of sewage overflows
- Builders to contribute a percentage of profit to waterways
- Yes – Yorkshire Water to be accountable for the day when they allow sewage into the River when in times of low rainfall. Restriction on pesticides around land near the Rivers to decrease leaching of chemicals into the River. Stop our children from being ill after paddling in the River in summer
- Cleaner water – more stable/better wildlife "foodchain" environments more diverse wildlife
- Yes – definitely – illness caused by the River to swimmers + bedracers is all too frequent (is this becoming a local tale/myth so more people are talking about it than is actually happening? Well when I spoke to councillor, she said it's always been a thing after the bed race)
- Renationalise the water companies
- Yes – water quality improve
- Yes: the current situation is disgraceful

Figure 28: Responses (as written) about what people would like to see change regarding the river from attendees at the March 2023 NAG event.

Some tensions remained in the group, and leading up to the summer bed race these came to the fore. Early river sampling results came in less than two weeks before the event showing high levels of E.coli in the water (3,000 coliform units per 100ml, above the bathing water quality standard of 1,000 CFU/100ml). Discussions were initiated over the responsibility of NAG to present these results to the public before the race. Thresholds of acceptability were shared, and one person asked for an interpretation of these to say whether the water was safe to swim in. Although participants of the race were advised that they enter the water at their own risk, one person said that the race organisers still held the ultimate responsibility for any illness caused by ingesting the water.

There was additional discussion regarding the variability of results, and one person suggested that Yorkshire Water may have been discharging less because they knew about the sampling taking place. Another raised the concern that there was nothing stopping Yorkshire Water from discharging sewage an hour before the bed race. This shows some misconceptions even among activists about water companies' ability to control CSO discharges.

7.5.4 Bathing water designation

Another event was held by NAG in December 2023, where the final bathing water application was presented to the town. This was a pivotal moment not only because of the low trust in the MP's office who produced the application, but also because securing bathing water designation would lead to substantial local investment and increased environmental monitoring. Once a site (a section of river or coastline) is designated for bathing by the government Department for Food and Rural Affairs (DEFRA), it receives increased monitoring attention from the Environment Agency (EA) because it should be of sufficient quality for human health, particularly regarding E.coli levels. If high E.coli is found to be present, the local polluters will be required to make some changes to their practices. For water companies this often means making substantial investments in sewerage infrastructures and upgrading treatment plants.

The presented application detailed designation criteria, survey data, site history and details, community consultation and letters of support from local stakeholders. The collection of letters was significant, with contributions from the chief executive of Yorkshire Water, other local politicians, the site landowners, NAG, environmental organisations, and many more (Jones, 2023). There was also a collaborative river project led by the Yorkshire Dales River Trust announced at this event, called INidd. Its aims are to conduct larger-scale sampling activities, as well as raise awareness about the river's ecology.

The support from Yorkshire Water shows a major change in their interest and approach this issue, compared with their first meeting. One activist reflected on this change "*somebody from Yorkshire, like the chief executive or something, discussing the importance of getting bathing water status, but then at the same time that's a bit odd because they're the ones who are partly responsible for why the water's dirty in the first place*" (I13).While it seemed like previously water companies' hands were forced by bathing water status, in Knaresborough it became the case that Yorkshire Water had told NAG it would commit funding to upgrading its infrastructure in this area, but that this would only be possible if bathing water status was approved.

This event was attended by a greater number of river actors, including Yorkshire Water and the Environment Agency who answered peoples' (sometimes hostile) questions in a fairly open and patient manner. One of the leaders of NAG reflected that this event was more informed and collaborative than the previous one in March, which did appear to be the case. There was some contestation over specific sampling results, which demonstrated that E.coli was not as high as previously thought, and did not exceed many thresholds of acceptability. The focus remained on the bathing water application, the work of environmental groups and the plans of Yorkshire Water and the Environment Agency if bathing water was to be granted. It seemed like this was already the expected outcome.

The rigor of the application seemed to demonstrate to many that the MP involvement was an asset, as described pragmatically by one campaigner: "*I think [the MP] appreciates the problem [Nidd pollution] and wants it to be resolved… but it's also, I suppose, feathering his own nest*." (I4). Others believed there was a deal done behind the scenes in parliament to get the application "*waved through… in order to get him, you know some security or you know, votes or whatever*" (I7). While most people won't know what went on behind the scenes, the end result was that the application was approved in spring 2024, along with 26 others, the most ever granted. After this, DEFRA closed future applications for at least two years (Donnelly, 2024).

7.6 Discussion

The story of NAG represented in the preceding section shows key moments of divergence and contestation, as well as rapid campaign progress. It provides an insight into the workings of a NWJM at the local level, with the complexities of pursuing water justice via pre-existing, place-based social structures and relationships. It also shows how activists are required to navigate the often obscure, and sometimes hostile, local and regional water governance systems. As Mihaylov and Perkins (2015) write, this case shows how, at the local level, the environment cannot be separated out as a single issue. As such, there is an interesting process that takes place, of collectively seeking to make a reality out of something that began as an idea or a feeling (for a healthier river), shared between a few people.

The origins of NAG are interesting to consider, with anglers noticing changes in the ecology of the river with which they interact on a regular basis. The idea emerges regarding how to protect this ecosystem. The threat they are protecting against is to both the ecology and the practice of fishing, which is important to them personally. After some months, collaboration begins with wild swimmers and local councillors. One this occurs group interests evolve, compromises are made by members, and informal hierarchies are reinforced. The central interests at this stage are protecting environmental practices (fishing and swimming) and the political (and personal) interests of local councillors, particularly the yearly bed race, which is a famous tradition in Knaresborough but (anecdotally) has a history of leading to illness from ingesting river water.

The coalescence of the river Nidd with the meaning of Knaresborough as a place spurs the passion of group members, as well as the resonance of their message with many residents. Research has shown that constructing and politicising a sense of place is an effective means of gathering local support, particularly against outside influence (Martin, 2008). Given Yorkshire Water's early dismissal of the issue, they swiftly became the focus of activist action and the main organisation from which to demand change, through the tried and tested method of applying for bathing water status. The informal leaders of NAG considered this to be the most effective way to force action

from Yorkshire Water and the Environment Agency, even though a number of environmental representatives commented that the greatest issues in the Nidd were agricultural runoff and mining legacies.

Three strands of work were agreed upon in a 2023 autumn meeting: raise awareness, sample the river, and apply for bathing water status. In practice, the first two aims were carried out to serve the final aim, although this appeared not the entire purpose at the outset. There was divergent beliefs within NAG regarding the importance of sewer discharges in the health of the Nidd. This divergence and lack of clarity remained after a summer of sampling. I suggest this is mirrored in other NWJMs in E&W; the gathering of data does not necessarily reveal a clear picture. This is also the case for EDM data, which is contested by water companies over not measuring the concentrations and resultant impact of the wastewater being discharged.

The issue of trust is often central in NWJMs. In Knaresborough, it emerged at various points, particularly regarding the role of the MP's office and the open sharing of sampling data. The leaders of NAG decided that the MP's involvement was simply a means to an end and provided much needed capacity (and political influence) for putting together the bathing water application. This decision left those in NAG who had strong opposition to the MP in a difficult position. Similarly, the core of NAG decided to collaborate with Yorkshire Water by the time bathing water was being applied for, which was a stark change from this relationship in the early days of the campaign. The priority became putting in a strong application and collaborating with the MP, Yorkshire Water and the Environment Agency. While this was an effective strategy for a successful application and fast action on sewer upgrading and environmental monitoring, it also necessitated conceding some control of the campaign to these established institutions.

The aim of achieving bathing water status were developed as NAG gained momentum and recognition, locally and regionally, but were not necessarily the goals of the early anglers' meetings. The advice from Ilkley campaigners about being single-minded about strategy were heeded in this way, and achieved progress in the way of becoming a bathing water. This has become a somewhat established route within official water governance structures, shown by the designation of 26 sites in 2024. However, this route was subsequently closed for further applications for at least two years, and will likely return changed to prevent the unsustainable designation of bathing waters.

In the concept of water justice, the desires of the activists and many residents to 'wrestle rivers away from influences that enclose, commodify or pollute' are clear throughout the story. Yet, the reality of how and what justice is achieved is not able to remain perfect or ideal. Substantial change was created by the dedicated action of NAG, and equally, this may not have been the kind of justice first imagined, and was not the kind imagined by all. The campaign's developments

highlight how forming alliances brings both benefits and costs. Some members of NAG felt the costs of partnering with the local MP were too high and chose not to remain part of the group. This splintering caused fracturing in some community relationships, but also led to the emergence of different forms of justice.

The political alliances and social capital of the NAG leadership created a dynamic of powerful insiders and less powerful outsiders; those in the town who wanted a clean river but did not want to work with the MP. Yet, those on the outside pursued justice in their own way, such as the man who read out the MP's parliamentary voting record against environmental legislation at the town meeting. He was enacting his own kind of water justice by announcing the inconsistency and lack of integrity in the Politian's actions. While this did not directly help to 're-distribute' water pollution, as NAG sought to do, it did publicly recognise some of the hidden, local power dynamics at play.

7.7 Conclusions

This paper presents a story of the web of social relationships in a town with a strong connection to its local river. The meaning of the Nidd is inseparable from the meaning of Knaresborough to many of its residents, and this drives much of the interest in its health. Further, the river's health affects the people health, particularly through wild swimming and the annual bed race. The sense of pride and connection spurs on a desire to care for the river.

Ideas of water justice in the literature consider distribution, recognition and participation. The NAG group and campaign in Knaresborough was developed informally by local residents with a keen interest in the river. While it was not representative of everyone in the town, it was also not closed-off to anyone either. Activists were seeking re-distribution which may have knock-on effects distribution in the region, possibly pulling funding away from rivers with worse health, but equally the Nidd has its own problems with worsening water quality. This paper focuses on key divergences and seeks to recognise the complexity of activism on this issue. However, it also recognises the impactful action of this small but passionate campaign.

A key point in Hommes et al. (2023) is that academia can learn from NWJMs. This paper portrays the reality of a local campaign, which highlights how justice theory and justice practice are hard to reconcile. Such tension gives rise to the importance of strategy and collaboration, which in this case are the most, potentially even the only, ways of making a change. Equally, there are times when collaboration with powerful intuitions can lead to a capturing and re-directing of activist goals, and a dampening of local fervour. People in Knaresborough who took a stand refusing to collaborate with powerful or political institutions gradually lost their personal influence.

Finally, water itself is also key to shaping the approach and goal of the NWJM in Knaresborough. As a hydro-social entity, H_2O is shaped by society and technology. The governance of water in E&W is highly complex, particularly in the corporate realm of financial decision-making. Further, water existing in both large-scale systems of provision as well as in the environment necessitates collaboration between environment and water sectors, coordinated at the national and regional levels but implementing at the local level. Many, although not all, people are seeking greater participation and inclusion in decision-making processes about water. While activists are making their voices heard, intuitions need to play their part in creating space for meaningful participation which values people's desires and does not only instrumentalise them for enacting their own plans.

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Chapter 8

Discussion

The previous four chapters present the findings from the individual studies comprising my doctoral research exploring water insecurity in E&W. I define water insecurity as the lack of safe, reliable, sufficient, and affordable water for individual human flourishing and collective equity among and within wider groups of humans and non-humans, is underpinned by this literature. My doctoral research explores three specific expressions of this concept, namely: household water poverty (or socioeconomic insecurity); water access insecurity among canal boat dwellers; and socio-ecological insecurity caused by sewage discharges.

Each results chapter makes its own unique contribution, as they have been structured as individual papers per the thesis by publication format. Each paper is framed slightly differently in order to be situated in specific sub-fields or niche literatures. Table 9 below is copied from section 1.4 to re-state the collection of papers, their individual contributions, and publication status.

Table 9: Summary of individual doctoral studies, their specific contribution, associated papers and publication status.

Study number and topic	Contribution	Position in thesis structure
Study 1: Rigorous literature review on water poverty.	Synthesises knowledge on water poverty, analysing it from a critical perspective, and revealing hidden structural processes.	Paper 1 (Published April 2023) *Presented in chapter 4*
Study 2: Ethnographic research on access to water and sanitation services with canal boat dwellers.	Documents the lived experiences of an excluded (non-customer) group, who are positioned at a greater risk of water insecurity. The capability approach is used to theorise how services contribute to or restrict wellbeing.	Paper 2 (Published Jan 2024) *Presented in chapter 5*
Study 3: Ethnographic and political ecology research on sewage discharges into Yorkshire rivers and local response.	This study is split into two papers. The first presents an analysis of the regional problem of sewage discharges in Yorkshire. The second approaches sewage as an issue of water justice in the small town of Knaresborough, Yorkshire.	Paper 3 (Submitted June 2024) *Presented in chapter 6* Paper 4 (In preparation) *Presented in chapter 7*

While the previous chapters are dedicated to the particular findings of each study, some of which are highly contextual, this discussion chapter synthesises these findings and wider insights in order to answer the overarching thesis research questions. Table 10, included below, re-states the overarching aim, objective and questions of this thesis.

Table 10: The overarching aim, objectives and research questions of my thesis.

Thesis Aim To explore water insecurity in England & Wales by applying a critical perspective and with a view to outlining its hydro-social dimensions.
Thesis Objective Investigate the diverse social experiences and politics of water insecurity in England & Wales.
Thesis Research Questions (a) What are the ways water insecurity is socially experienced in E&W? (b) What political processes and institutional narratives produce and obscure water insecurity? (c) How do individuals and place-based groups challenge top-down water insecurity narratives, and shape new ones based on hydro-social knowledge? (d) What are the practical and theoretical implications for understanding contemporary and future hydro-social relations in E&W?

8.1 Diverse ways of experiencing water insecurity

First, considering question (a), this body of research has shown that there are diverse and nuanced ways of experiencing water insecurity in E&W. In section 2.2, I suggest that highlighting social experiences of water insecurity can work to reveal the modern water paradigm, and the obscured social context of water. In my research, I found that when water is restricted, vulnerable people living in households and non-standard dwellings feel the impacts on their lives holistically. Additionally, through reviewing the water poverty literature, I found that the prevalence of this condition is far more common than is widely acknowledged, with up to 20% of households in E&W meeting the requirements for water poverty in 2019/20, and up to 10% meeting the acute threshold. This is one of the most prevalent forms of water insecurity in this context.

The academic and grey literature predominantly treat water poverty as an economic condition. However, I found that water poverty is in fact deeply social in nature, and is one common way that people experience water insecurity. As such, I consider this to be a socioeconomic form of insecurity. The social research reviewed demonstrated how many people living with water poverty felt emotions including ‘anxiety, fear, helplessness, anger and a sense of isolation’ (CR,

2014). This affects people's lives holistically, including but beyond the aspect of finances. Further, negative emotional impacts due to water poverty show that this experience is relational in nature, as emotions are often felt and enacted in relationship with others. This helps to explain why people with a familial support system are often able to cope better with these pressures, as found in the related energy poverty literature (Longhurst and Hargreaves, 2019; Middlemiss, 2015).

This burden of water insecurity also arose strongly in my second study with canal boat dwellers. The act of physically accessing water added to the regular chores of the boating lifestyle, but divergent perspectives on this quickly emerged. It became clear that not all boaters considered themselves to be experiencing water insecurity. Many (about half of the people we interviewed) saw the practice of self-suppling water as an inherent part of being a boater, and did not view the effort involved as 'struggle'. A few interlocutors even thought of themselves as lucky; being facilitated in living this itinerant lifestyle by waterway service points. One in particular felt that the irregularity or uncertainty of service points was part of the character of the lifestyle, and the presence of more regular service points would restrict their ability to live off-grid, away from the surveillance of society.

This perspective sits in stark contracts to the boaters who felt that they were indeed struggling to cope with the responsibilities, mental planning, and physical effort involved in self-supply. A pattern emerged that most of the people who viewed water in this way were already vulnerable or struggling in another aspect of life, whether that was mental health, physical health, financial security, or relational support from others. For these people, we found that six of Nussbaum's (2011) core human capabilities were restricted due to the insecurity around water access. These were: bodily health; senses, imagination, and thought; emotions; practical reason; affiliation; control over one's environment.

Further, I also investigated social experiences of sewage discharges in rivers in Yorkshire, which I consider to be a socio-ecological form of water insecurity. Some similar emotions were expressed by people in this study, such as worry, anxiety, and concern for public and environmental health. However, a key difference was that the predominant emotions among activists were anger and frustration. These feelings arose partly from people feeling unable to carry out their preferred wellbeing activities, like wild swimming, or having to do so at an increased health risk. They also arose from a sense of injustice over the visible degradation of the environment (often locally) and wider water cycles.

A couple of themes emerge across the three studies on the question of social experiences. One is emotional response, as discussed, which affects people's lives holistically. Another is the theme of choice, interlocutors in my third study had generally made a deliberate choice to take action on

the issue of sewage discharges. Boaters were split, in our sample seemingly fairly evenly, along the lines of whether or not they had chosen their lifestyle and the water situation that came with it. Conversely, the vast majority of those in water poverty do not choose to live in this way.

The additional theme of affiliation with a social group also resonates across the three studies. Often people experiencing water poverty were isolated to their household, and one of the key messages in the grey literature was improving conditions for customers to reach out for support. Many vulnerable boaters were also isolated, or felt they had been let down by institutional, community, or personal support systems. Connections with other boaters were often reported to be deeply helpful in both practical support but also just a sense of feeling affiliated and less alone. With water activists, these gained their power through affiliation with a social group, and this affiliation was formed over the shared sense of injustice. This growing phenomenon is what Boelens et al. (2023) term new water justice movements.

Therefore, amplifying the realities of those experiencing water insecurity confirms that water insecurity does in fact exist in this context, in a variety of ways. Emotional response, choice and agency, and affiliation with a wider social group are some key themes around such experiences. These findings support my assertion that highlighting lived experiences can reveal some of the workings of the modern water paradigm. The following section details some of these modern water processes further.

8.2 Processes producing water insecurity

Part of research question (b) asks – what political processes contribute to producing water insecurity? I find a number of these across the three studies. One key process that works to produce water poverty is the cyclical nature of bad debt management in the water sector, which seeks to recover the costs incurred by bad debt through customer billing. In addition, a 20% proportion of customer bills going to servicing general water company debt. The burden of these debt processes are felt by (often vulnerable) customers who are living with, or on the edge of, water poverty. Further, the captive nature of their revenue allows companies to borrow sums which have led to gearing levels reaching 60-80% (Laville and Leach, 2022). These hidden financial practices are interrelated with water poverty, as companies borrow based on the assurance of customer bills while those with affordability issues cannot guarantee their payments. The accumulation of company profits and shareholder dividends while low-income and vulnerable customers continually struggle to pay, and the economic depth of water poverty increases (NEA, 2019), demonstrates the immense socioeconomic inequality in the water sector.

Following on from these findings from study one, my third study suggests that as water activists are becoming increasingly influential, some of these billing processes are being exacerbated and risk increasing the prevalence of water poverty. Seeing as infrastructure upgrading costs are usually shared across a company area, questions have been asked of activists regarding the fairness of charging all households in Yorkshire for upgrading one specific sewer (such as in Ilkley or Knaresborough). This will likely be the case in a number of new bathing water areas. Conversely, the new sewer in Ilkley is being financed through future asset management plan (AMP) funding being brought forward, yet this money is still being re-directed from its original allocation elsewhere in Yorkshire.

A number of interlocutors discussed the investment 'queue' or list put together by water companies, regarding the timeline of upgrading various infrastructures. Many people saw activists as trying to jump this queue, and many in Ilkley and Knaresborough did indeed express frustration that they were originally a low investment priority. In places where bathing water status has been granted, activism has been successful in securing investment timelines that are now a number of years rather than decades. A concern is that this action pushes areas without influential campaigns further down the queue, and some areas (such as Bradford) may be in greater need of investment. While a valid concern, it does rest heavily on a trust in water companies' decisions around investment priorities. While companies do have much of the expertise to make these decisions, the fact that they are made behind closed doors (Bayliss, 2016) has created a situation where individual groups feel they need to fight for priority.

Further, I found a number of other processes that work to produce this socio-ecological insecurity. One is the regulatory practice of 'acceptable' fines that Ofwat charges water companies over sewage discharges, which the EA note are lower than company executive salaries (Hambly, 2022). Such accepted regulatory practices inside the water sector have allowed companies to continue to operate in this way for many years. Other related processes such as short, five yearly AMP cycles and the need for companies to produce profits to secure investors (as private businesses) have also contributed to gradually degrading sewerage infrastructure.

According to water industry literature and interviewees, the government has sought to keep water bills low since the early 2000s. This may partially be in effort not to alert the general public about the impacts of water privatisation, after the widespread opposition in the 1990s to bill increases (as well as household disconnections). Water companies argue that pressure on them to keep bills low in a blanket manner has restricted investments in infrastructure, water companies have been able to make, contributing to its declining functionality and resulting in a sharp rise in bills (of up to 44%) in the next few years (Lawson and Horton, 2024).

In terms of regulation processes, companies are mandated to protect the interests of customers, but Ofwat also has the role of enabling companies to operate in ways which protect their business interests, such as making their companies an attractive investment for shareholders. These two regulatory roles are contradictory and seemingly impossible to enact in practice. Further, the ability of the EA to hold companies to account for sewage discharges has been greatly reduced with huge cuts to their budget since 2010 (Lovett, 2022). The state has effectively hidden its part in producing this regulatory environment Bakker (2000), but in reality, it maintains a lot of power in this area.

The final process producing insecurity from my research is the exclusion of people who are not company customers. This exclusion often overlaps with other political and social exclusion, such as in the case of GRT groups (John, 2022). Non-customers are positioned in the DP (Meehan et al. 2022, 2023) which increased their risk of water insecurity. However, while this top-down theory reveals the process which exclude there groups from 'customer-status', there is also the question of whether these people actually want to be included as a customer. My second study with boaters showed that it cannot be assumed that people in this paradox are vulnerable or lack agency. It also suggests that some do not consider an insecure supply of water as something which restricts their chosen lifestyle. Yet, many do feel restricted by such insecurity. The process of the DP and how people live with it is an area in need of further research.

8.3 Narratives obscuring water insecurity

The second part of question (b) pertains to the institutional narratives which obscure water insecurity. I have found that a number of high-level narratives work to obscure its existence, which is partly why the notion that secure water services may not exist for all people is still not widely held in this context.

The first is the government's assertion that water insecurity is a rare and insignificant problem in E&W. This is evidenced by the high self-scoring of SDG 6 indicators. For instance, SDG 6.3.1 proposes that 97% of wastewater in the UK was 'safely treated' in 2022 (UN, 2024). The UN definition of safely treated refers to the 'proportion of wastewater flows treated and discharged in compliance with national and local standards'. So, while EDM data shows that 1.75 million hours of sewage was discharged through CSOs that year (Stallard and Fisher, 2024), some of this counts as safely treated when it occurs during periods of heavy rainfall, as this is permitted by national standards. However, dry spilling has also been revealed to occur frequently, a practice that is illegal (Stallard et al. 2023).

In addition to wastewater treatment, the scoring of SDG 6 social indicators obscure the existence of marginal groups and any problems regarding hygiene, community participation, or gender equity, with no scores being attempted for these areas (Mdee et al. 2024; UN, 2024). Further, target 6.5.1, indicator 2.2, part c is scored at the maximum (100) on the 'participation of vulnerable groups in water resources planning and management' in both 2020 and 2023 (UK Government, 2020; UK Government, 2023). From my research, I find this to be explicitly false, and demonstrative of a complete unawareness of the situation of vulnerable groups by the government[52] combined with a deliberate decision to portray an image of inclusivity. In particular, the exclusion of non-customer groups contradicts this score, such as the ignorance of boaters and the discrimination against GRT people (John, 2022; Eminson, 2024).

In addition, the human rights to water and sanitation are supposedly upheld by the UK government but legislation does not apply them to the UK, instead it focuses only on their international applicability and the role of the UK in upholding that (UK Government, 2012). This obscures the relevance of human rights in this context, again revealing both ignorance and deliberate obscuration by government in order to maintain the image of E&W as 'highly developed', with no need for examination through a rights lens. This reinforces the power of the UK on the global stage. However, the 2018 Special Rapporteur on extreme poverty and human rights demonstrated the need to apply a rights lens in the UK, writing:

"*Abandoning people to the private market in relation to services that affect every dimension of their basic well-being, without guaranteeing their access to minimum standards, is incompatible with human rights requirements*." (Alston, 2018, p.11)

This report finds an incompatibility between upholding human rights and the extent of water privatisation in this context, showing that it is in the government's interest to obscure water insecurity processes and experiences. Further, this high-level narrative hides the state's ultimate responsibility for ensuring full access to safely managed water services for all people in E&W (Heller et al. 2020). This is also unfolding in real time during the current wastewater crisis. As EDM data on sewage discharges has become publicly available, political attention has focused keenly on water companies. This works to continue to hide the role of the state in allowing the private water industry to operate as it has done since 1989.

Privatisation of the water industry in 1989 re-configured water governance and the role of the state became less visible (Bakker, 2000, 2003). The Thatcherite government at the time sought to greatly reduce the role of the state in the lives of citizens, and yet this has proved untenable in the

[52] I spoke to a former high-level civil servant who specialised in this area, and asked them about the situation of unhoused populations. They admitted to not being aware of this aspect of water services. When I asked how water was accessed and paid for in caravan sites, they commented that this was up to the private site owner and not the responsibility of government.

case of water provision. The intervention of the state in the water industry through banning disconnections and providing a subsidy for South West Water customers demonstrates this, as shown in study one.

As well as the invisibility of the state's high-level responsibility, privatisation also obscures the active and ongoing role of the state in water governance. Bakker emphasises that it has a strategic role in the marketization of water, and it does not retreat but rather repositions itself as an active agent "*in the transition from a "state hydraulic" to "market conservation" mode of water supply regulation*" (Bakker, 2003: 55). E&W is an ideal case study for this re-configuration. My research shows government directs the practices and behaviours water industry discretely through regulation, and intervenes publically when it is able to take a moral high-ground (such as banning household disconnects in 1999 and demonising sewage discharges in 2024). In cases of overt water injustice, it is always the state who is called upon by both the public and the water industry to take action and accept high-level responsibility.

In their study on water poverty in Scotland, Anderson et al (2023) connect water poverty with water injustice more extensively, arguing that the technocratic nature of water poverty in policy and discourse obscures the 'perpetuation of injustice'. This is also the case in E&W. If we also consider the industry narrative about 'won't pay' customers, together they obscure the prevalence and structural nature of water poverty.

8.4 The power of hydro-social knowledge in the modern water paradigm

So far in this chapter, I have demonstrated how social experiences of water insecurity reveal some of the hidden structures of the modern water paradigm. These experiences also challenge top-down narratives about water insecurity, with the highest-level narrative being that it doesn't exist in this context. Other ways experiences challenge narratives include; how people living with water poverty refute the notion that this is purely an economic condition, how some people living in the DP refute the label of vulnerable, and how water activists are bringing attention to hidden sewage discharge and associated regulatory practices.

Research question (c) asks how individuals and place-based groups challenge top-down water insecurity narratives, but also how they shape new ones based on hydro-social knowledge. This type of knowledge expresses how people are an inherent part of water systems, and relate to water on a social level. Under modern water, the hydro-social cycle conceptualises how our knowledge of water today is shaped by the interaction between H_2O, infrastructure, and society as shown below in figure 29.

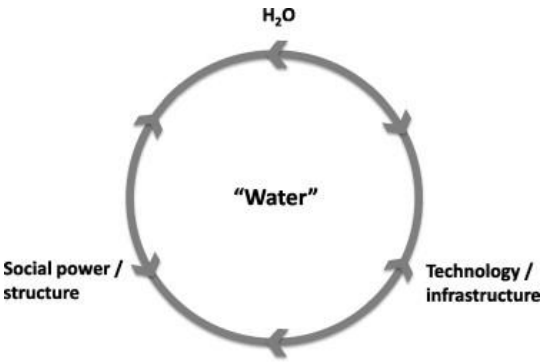

Figure 29: The hydro-social cycle (Linton and Budds, 2014).

While Linton (2010) theorises that people become disconnected from the hydro-social nature of water under the modern water paradigm, I contest that this is always the case, through my work. While hydro-social relationships have been re-configured to some degree under modern water, I return to Strang's (2023a) assertion that all humans fundamentally share a similar relationship with water, because of its constant physical properties, sensory experience, and place as essential to life. Powerful expressions of relating to water can create visions of more equitable, secure, and just water systems for the future. Below, I discuss a few examples of this vision.

In study three, a couple of interviewees shared their reactions to seeing rivers in a holistic way. While this sentiment was discussed briefly in chapters 6 and 7, these full quotes were not included due to the paper word counts, but they are presented here to help illustrate this point in the words of interlocutors. Both refer to technical data collected at a large-scale which essentially portray a joined up picture of what is happening in a river beyond the purview of the individual. A representative from the EA shared:

"*We showed some real time data in the river, showing the diagonal variations that you get from the interaction with the plant and algae communities... Someone's feedback was just like, how fascinating a breathing river, which you know isn't correct, but you could see that connection and well, I guess it is correct in some ways… If you consider it as a whole and all the plants and algae there in it as part of that.*

I thought it was just a nice a nice way of viewing it, you know which put a little bit more emphasis on it being something that has to be looked after, which was quite nice." (Study 3, I10)

Additionally, an academic who has been supporting activists' sampling activities and progressing citizen science discussed the iWharf project in Ilkley, which was designed to sample the river in multiple locations all at once. They explained:

"*What we're able to do with iWharf, it's just beautiful data in fact. We just get people all the way along the river, trained up. You've got to have multiple sampling set sets of sampling equipment and things, but all people taking samples all at the same time, so we know the story.*

We sampled 125 kilometres to the river in in three hours. Basically during constant flow conditions and the actual chemistry is so coherent. Downstream is absolutely beautiful.

So it's a real snapshot. The last time (I did it) it was with the graduates. You know, on the third year sort of field class where you could have about 1520 undergraduates and you can get them all scattered around the countryside.

In fact, again taking samples at exactly the same time so you can actually have some spatial comparison spatial coherence in the data and it's fabulous." (Study 3, 112)

These two stories stood out to me while conducting interviews. It seemed unusual but exciting to hear quite technically-minded, methodical people using language which described rivers as beautiful and alive. I see this as an example of the coalescing of a modern perspective on water (regarding scientific, quantitative testing) with a more holistic sense of the entity or being that is 'The River'. This sense is emphasised in the water kinship literature, discussed in sections 2.5 and 2.6. The first quote expressed that this living perspective places a greater emphasis on the river as something which needs to be looked after. This is reminiscent of the inextricable sense of responsibility and duty that comes with relating to waters in the Indigenous literature, discussed in section 2.5.

Waters are both integral to human flourishing, and complex entities in their own right. The largely invisible nature of their ecosystems and character has perhaps made it easy for modern water to re-configure them as simply a resource. In some Indigenous traditions globally (Chiblow, 2023), and notions of kinship in E&W (Strang, 2023a), these invisible properties of water are recognised through sociocultural belief systems. Such beliefs are on the rise in E&W, for instance with paganism increasing (Cohen et al. 2023). Equally, the scientific approach to water is highly valued in society in this context, and I find that the previous quotes show that these two approaches are not so dissimilar. As such, either perspective, or a combination of the two, can help move towards securing water systems and cycles in E&W.

Further, in my second study I found that boaters are also shaping new perspectives on water through hydro-social knowledges. While people's reasons for moving on board are complex, some common reasons aside from affordable accommodation include: nomadic lifestyle, alternative community, off-grid living, and lower carbon footprint (Sterritt, 2022). Whether out of free choice or constraints, many boaters are enacting different kinds of hydro-social

relationships than people living in conventional households. Their lives are closely related with shifts in the water environment, such as low water levels or pollution incidents. They are also more attuned to the water resources they have available on board, with most interlocutors explaining to us their various water saving techniques, such as using greywater to water plants. This lifestyle also affects their social relationships, with other boaters and with the wider public who use the towpaths, as they share (limited) space and water.

The perspectives that emerge from this study pertain to the interdependent nature of life and water cycles. Those who are vulnerable feel the effects of being more exposed to the times when these cycles do not centre the needs of humans, as conventional human society does. Boaters who are able to embrace living with these cycles, reported experiencing a rewarding reciprocal connection between their resource use and care for the environment. Some of the water-saving practices and attitudes that boaters employ are the same ones the water industry wants household customers to adopt.

8.5 Practical implications: repairing water relationships

After discussing research questions (a), (b), and (c), this final section considers the first part of question (d) – the practical implications of my research. The following conclusions chapter overviews the second part regarding theoretical implications.

One of the strongest practical implications of my research is the issue of water companies' relationships with their customers. This emerged strongly in my first study, with many grey documents showing that this relationship is a serious source of stress for many of those living with water poverty. Upon privatisation, the water bill became the main form of communication between companies and customers, and as such is key to determining the image of the company. Other types of communication are often sporadic, and often relate to infrastructure works or telling customers how (not) to behave, such as putting wet wipes down the toilets.

Before 1989, payments were reportedly collected on a weekly or biweekly basis at the same time as council tax, by a council representative who would often come to the door. This would not only reduce the amount of money needing to be paid into smaller instalments (today, it is six monthly billing unless the customer requests otherwise), but would enable the payment collector to see the condition of the house and understand better the financial or emotional situation of the occupants (Bakker, 2001; Marvin and Guy, 1997). While this is not really feasible today, it is an example of a more transparent and relational form of interaction.

Important to note here is that while water companies are now private businesses, they are also providers of an essential service and a basic human right. As such, although companies mainly

operate as private businesses in their interactions with customers, they are also constrained from cutting of services, and customers are constrained from switching provider. I suggest that water companies themselves do not know how to best operate in this contradictory space, and as such leave much of the onus of communication on customers. This is shown to be problematic in the case of customers with mental health conditions, as discussed in section 4.5.

These relationships are also becoming increasingly contentious with many other customers due to the prevalence of sewage discharges, and the scale of profits being made by shareholders and executives. Transparency has always been an issue for the private sector, but in order to improve relationships with customers and the wider public moves towards openness are necessary to repair trust. Bayliss (2016) discusses how the financial decisions in the water industry are conducted in a closed-off manner by a 'tight group' of agents from Ofwat, water companies, and financial advisors. Not only does this affect relationships across this boundary, but it also causes narratives to circulate and escalate inside the sector.

Such narratives I noticed in my research were often about the behaviour of customers, which create mistrust in the reverse direction, and further reduce the possibility of trusting company-customer relationships. At a number of water industry events[53], I noticed general agreement over the perceived lack of value customers give to water. For example, one person put forward the scenario of customers running showers to warm up a bathroom before getting in[54]. An environmental example is people paving over their gardens, and the runoff and flooding implications. While these examples and feelings of water professionals are based in real actions that are creating unsustainable water systems, opening up improved channels of communication to help customers understand systems better is a more effective response compared to blaming and shaming people.

These examples show how certain customer behaviours become focal points for the shared frustration in the water sector. However, I suggest that the deeper cause of this frustration is the nature of modern water, which abstracts water from its context and funnels it into systems intentionally designed to be convenient and discrete. Customers have become accustomed to these systems, and initiating a change in behaviour and perspective requires engaging with these more fundamental design elements. Equally, there is a shared responsibility for caring for water systems, and the notion that our household waste should simply disappear has created some problematic customer expectations. The lifestyle of non-customers, such as boaters, can offer some reflections on this expectation, as discussed previously.

[53] Particularly the 2022 UKWIR conference and an Ofwat funded new housing developments workshop. But I have also noticed similar sentiments at online talks and webinars.
[54] I responded that this may have more to do with a lack of heating in the bathroom rather than a lack of value given to water.

The transactional nature of the company-customer relationship creates the expectation that in return for regular bill payment, water companies should quietly take care of the technical, sustainable, and ethical management of water. This premise is what has fuelled the rise in bill boycotts in recent years (Boycott Water Bills, 2024). However, this also obscures the role of customers as fundamental components of the system. While many new water justice activists are motivated by their feelings about local waters, the major goals of their campaigns are often investment in infrastructure and financial retribution for water companies, which creates subsequent tensions. For instance, in Ilkley, large investments are being made by Yorkshire Water into the town's sewerage, to meet the target of protecting the bathing water site by diverting the sewer around it (Yorkshire Water, 2024). Many interlocutors from the water and environment sectors questioned the logic of laying down more hard infrastructure or 'imbedded carbon' in pursuit of environmental justice.

In this way, the commodification of water has influenced the objectives and mind-set of many customers and activists in E&W, as well as the water industry. It is incredibly challenging to think about water in a different way and call for change using a language different to what is used in contemporary water governance. However, while public discourse often blames the industry for the commodification and exploitation of waters, this obscures the role of the state (Bakker, 2000) which has enabled this approach to water throughout the era of modern privatisation. In an interview, one water company representative with decades of experience in the industry discussed how the re-configuration of water companies from state agencies to private businesses changed their performance drivers, commenting:

"*The people who run it for a while after that (privatisation) were people whose water was in the blood. You know, there were long term water industry people. They recognise the water industry… is more important to public health than the National Health Service. We had a bunch of very senior people who believe(d) that and that was part of their culture. As they went on, that shifted and much more corporate people started to get involved. You know the corporate financiers. Who want to see - How much money can we get out of this?*" (Study 3, I15)

This quote demonstrates the importance of making distinctions between water engineers and managers, and those working at the corporate levels. Those at the 'lower' levels are the people with the closest proximity and experiential knowledge of water in its industrial form in this context. Those at the higher levels are competing with one another between companies to make investment in water the most attractive, by taking financial engineering to its extremes. While it is obvious to say, the practice of financialisation is clearly incompatible with repaired and secure water relationships.

The complexity and closed-off nature of the water sector makes meaningful public participation a significant challenge (Bayliss, 2016). An assumption at the start of my research, partly derived from the new water justice literature, was that activists and those living in the DP desired greater participation in water governance (Boelens et al. 2023; Hommes et al. 2023). However, I found this was more nuanced and varied from person to person, and campaign to campaign. It seemed that desire and possibility for participation largely came down to relationships between individual actors. I found that participation involved local collaboration between people who worked for different water and environment entities, and members of the public. While some reciprocal and fruitful relationships were developed in Knaresborough, for instance, given the ultimate decision-making power or governance arrangements of the corporate leadership, relational participation often appeared to be instrumentalised.

For example, citizen science testing has become increasingly popular, and was a topic of many conversations in study three, although it didn't make it into my papers in detail. The consensus view appeared to be that its greatest benefit was to provide a way for people to engage with their local river, and participate in its management, as well as understand it better. The piece about contributing to more widespread monitoring (and the 'usefulness' of the data collected, for regulation and decision-making purposes) was debated. While steps were being taken by leading scientists to improve methods and accuracy, a common suggestion was the lack of capacity in the EA had led to an exporting of testing labour to local people. This is a developing area, with a lot more nuance, but it is an interesting example of a new form of participation in water governance, and the risk of instrumentalisation.

Finally, the last practical implication of my work is the need to for government and the water sector to acknowledge non-customers and assign clear responsibility for their service provision. In the case of boaters, this responsibility may be assigned to navigation authorities, local councils, or water companies, but at the moment these responsibilities are unclear. The only written evidence pertaining to them is in the Transport Act (1962) which attributes the duty of service provision to CRT (formerly British Waterways) but expresses this extremely vaguely; 'to such extent as they may think expedient'. This is an insufficient basis for the official provision of basic services to this group.

8.6 Chapter summary

Overall, the practical implications of my work are broadly: the improvement of communication, transparency, and recognition between water actors and the wider public. The ways people in these groups relate to one another have been affected by the modern water paradigm, creating disconnections and frustrations between them, particularly companies and customers. Greater

openness by the water industry can facilitate re-building trust which is required for improving relationships. Additionally, the behaviour of customers, as well as their meaningful participation in water governance requires further clarity and direction.

This chapter has also set out the various processes and narratives producing and obscuring water insecurity in E&W, as well as the diversity of social experiences, which are connected through themes of emotions, agency, and social affiliation. The power of hydro-social knowledges to challenge the paradigm of modern water is also discussed. The following chapter overviews the theoretical implications of my work, extending critical scholarship on water insecurity in this context.

Chapter 9

Conclusions

In this thesis, I have presented a detailed exploration of water insecurity in E&W, as I define it as an individual and collective issue of safe water services supporting human and non-human life. I demonstrate its nuanced and multi-dimensional nature, investigating specific dimensions in depth in each of the four results chapters. I investigated a diversity of social experiences and politics by applying a critical perspective to this phenomenon, which has minimal existing research in this context. The literature in E&W treats water insecurity as a natural problem, caused by population and climate shifts (Cook, 2016; Dobson et al. 2020). I challenged this naturalisation by bringing in a critical perspective, learned from global political ecology and economy scholarship. This scholarship shows that water insecurity is, in fact, strongly tied to political decision-making, economic structures, and state and institutional narratives (Mehta, 2013; Zeitoun et al., 2016; Selby et al. 2022).

The theoretical basis of my research considered how the governance paradigm of modern water (Linton, 2010) applies in E&W. I found that, particularly since privatisation in 1989, this paradigm has affected how the state, the water sector, and the public think about water. The economic dimensions of water have become the primary lens through which it is viewed, and its social context is removed upon physical abstracted. However, my findings suggest that this does not necessarily cause people to become deeply disconnected from water, because of its fundamentally social nature. Strang (2023a) comments that all humans share a similar relationship with water, because of its constant physical properties, sensory experience, and place as essential to life. Therefore, although modern water has re-configured many of the ways we think about water in E&W, it remains central to the human experience of modern life. I also suggest that the social context of water is re-created in the home and in the local water environment.

Through data collection, I found evidence of a diversity of social experiences of water insecurity. In particular my studies focused on: people living with water poverty; water insecurity for those living in the dwelling paradox; and socio-ecological water insecurity. I show how these expressions affect people's lives holistically through their emotions, health and wellbeing, and restrictions on the life they want to live. These findings reveal and interesting tension between human flourishing, as conceptualised in the capability approach (Sen, 1979; 1985), and the necessary reciprocity of hydro-social relationships (Linton and Budds, 2014; Strang 2023a). This tension highlights the challenge of enabling all people to access the resources they need in order to live a good life, free of imposed restriction, while also de-centring humans from wider water

cycles. The concept of hydro-social relations helps with this challenge, by both affirming that humans are an integral part of water cycles and asserting that we are not at the centre of them.

In my research, I find that people can live flourishing lives even while living with some restriction, if people feel like they have chosen to live with that restriction for a wider purpose, such as part of a commitment to a healthier environment. I suggest this choice is usually made from a place of security, and cannot be made as easily from a place of insecurity. People with particular water needs or with vulnerabilities often require some additional human relationships or institutional structures around them to buffer the struggles they face. In a similar way, water environments themselves require representatives to assert their rights to exist and to flourish in their own right, as well as for the interdependent lives of other beings.

In addition to exploring these hydro-social dynamics, I also found a number of political processes that work to produce water insecurity. These include the production of water poverty through water governance financial structures, the exclusion of non-customers from conventional modes of services provision, and socio-ecological insecurity created through a number of water company and regulatory practices. At the governmental level, these processes are often obscured through narratives which serve to legitimise the state power of E&W on the international stage, particularly the notion that water insecurity does not exist here (Mdee et al. 2024). This not only justifies the involvement of E&W in international water politics and programming, but also creates a wilful ignorance of water insecurity issues at home, as well as de-legitimising the lived experiences of many people.

Although the state's role in water governance remains obscured by the political focus on water companies, the general public are becoming increasingly engaged with water politics and environments. This is clear through the action of new water justice movements, the scientific activities like river sampling, and the growing popularity of nature-based religions (Cohen et al. 2023). This shows momentum towards re-engaging and re-connecting with waters by people who live under the modern water paradigm. I suggest that some of the contradictions of this paradigm are becoming apparent in individual people's lives, as well as more broadly in the public consciousness. This move towards embodied connection does not have to look like a harkening back to pre-industrial lifestyles, although some find this appealing. Rather, I suggest a relational turn within a context which has been heavily influenced by the modern water paradigm, broadly looks like finding new ways of connecting to water in its 'modern' form.

One possible future of hydro-social relations in E&W may be a popular movement to simplify the governance of water and the lifestyles we lead, such as a radical reduction in the amount of water we use. Equally, another possibility is a move towards much greater built system efficiency and public awareness, so that people understand the extent of the personal benefits we receive

from flowing waters in and out of our homes. This would include a more diverse valuation and care for environmental waters by all people and institutions in E&W, such as river restoration, local rituals, and replacing hard infrastructures with green solutions.

Regardless of exactly what scenarios may ensue, there are clear aspects of the modern water paradigm which people are rallying against in this context, and must be transformed for a more secure future. In particular, these are the purely economic valuation of water, and the obscurity of water industry governance structures. These worsen relationships between water companies and customers, exclude those not living conventional lifestyles, and distribute the effects of insecurity onto many of the most vulnerable people and environments in society. A paradigm of relationality rather than commodity will value these groups rather than disregard them, and will support the protection of environmental waters as places which provide life, diversity, and freedom.

Lastly, my findings open up avenues for further research on water insecurity in this context, particularly its politics and social dimensions which are currently major gaps in the literature. My work begins an exploration of these areas, with a hope that this field will develop and expand. I re-iterate that, while the lens of modern water has refracted the ways many of us in E&W think about water, the way we know water remains embodied and universal. Focusing on this commonality can help to foster care and connection in pursuit of a more secure future for all.

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Appendices

Appendix A: Ethical Clearance University of Leeds – Study 2

Conditional approval based on evidence from Newcastle Universuty of Dr Underhill's ethical approval:

Dear Ruth

MEEC 21-017 - Investigating the boundaries of water poverty in England and Wales

NB: All approvals/comments are subject to compliance with current University of Leeds and UK Government advice regarding the Covid-19 pandemic.

I am pleased to inform you that the above research ethics application has been reviewed by the Engineering and Physical Science Ethics (EPS/FREC) Committee and on behalf of the Chair, I can confirm a **conditional favourable ethical opinion** based on the documentation received at date of this email and *subject to the following condition/s which must be fulfilled prior to the study commencing:*

1. **Ethical approval is also given by Newcastle University to cover Dr Helen Underhill's participation.**

The study documentation must be amended where required to meet the above conditions and submitted for file and possible future audit.

Once you have addressed the conditions and submitted for file/future audit, you may commence the study and further confirmation of approval is not provided.

Please note, failure to comply with the above conditions will be considered a breach of ethics approval and may result in disciplinary action.

Please retain this email as evidence of conditional approval in your study file.

Please notify the committee if you intend to make any amendments to the original research as submitted and approved to date. This includes recruitment methodology; all changes must receive ethical approval prior to implementation. Please see https://ris.leeds.ac.uk/research-ethics-and-integrity/applying-for-an-amendment/ or contact the Research Ethics & Governance Administrator for further information on researchethics@leeds.ac.uk if required.

Ethics approval does not infer you have the right of access to any member of staff or student or documents and the premises of the University of Leeds. Nor does it imply any right of access to the premises of any other organisation, including clinical areas. The committee takes no responsibility for you gaining access to staff, students and/or premises prior to, during or following your research activities.

Please note: You are expected to keep a record of all your approved documentation, as well as documents such as sample consent forms, risk assessments and other documents relating to the study. This should be kept in your study file, which should be readily available for audit purposes. You will be given a two week notice period if your project is to be audited.

It is our policy to remind everyone that it is your responsibility to comply with Health and Safety, Data Protection and any other legal and/or professional guidelines there may be.

I hope the study goes well.

Best wishes
Rachel Prinn

My response with evidence attached:

Dear Rachel

Thanks very much for this.

Regarding condition 1, I can confirm that Dr Helen Underhill has received ethical approval from Newcastle University. The reference for this application is "**19698: 'Nor any drop to drink': Experiences of Water Insecurity on the UK's Inland Waterways**". I have attached the Newcastle ethics form to this email, for your records.

Many thanks
Ruth

Confirmation of approval from the ethics administrator:

Hi Ruth

That's great, thanks for sending on. I will file with your study application.

Wishing you well with your study and thanks again for your patience with the delays.

Kind Regards

Rachel P

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Rachel Prinn, Research Ethics Administrator, The Secretariat, University of Leeds, LS2 9NL,
r.prinn@leeds.ac.uk
Please note my current working days are Tuesday, Wednesday, Thursday am.

Upcoming annual leave/University closed dates:
University Closed Days: 29/08/2022 & 30/08/2022 August Bank Holiday
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Appendix B: Ethical Clearance University of Leeds – Study 3

Dear Ruth

MEEC 22-010 – What is the role of public participation in water sector governance?

NB: All approvals/comments are subject to compliance with current University of Leeds and UK Government advice regarding the Covid-19 pandemic.

I am pleased to inform you that the above research ethics application has been reviewed by the Faculty of Engineering and Physical Sciences Faculty Committee and on behalf of the Chair, I can confirm a favourable ethical opinion based on the documentation received at date of this email.

Please retain this email as evidence of approval in your study file.

Please notify the committee if you intend to make any amendments to the original research as submitted and approved to date. This includes recruitment methodology; all changes must receive ethical approval prior to implementation. Please see https://ris.leeds.ac.uk/research-ethics-and-integrity/applying-for-an-amendment/ or contact the Research Ethics Administrator for further information epsresearchethics@leeds.ac.uk if required.

Ethics approval does not infer you have the right of access to any member of staff or student or documents and the premises of the University of Leeds. Nor does it imply any right of access to the premises of any other organisation, including clinical areas. The committee takes no responsibility for you gaining access to staff, students and/or premises prior to, during or following your research activities.

Please note: You are expected to keep a record of all your approved documentation, as well as documents such as sample consent forms, risk assessments and other documents relating to the study. This should be kept in your study file, which should be readily available for audit purposes. You will be given a two week notice period if your project is to be audited.

It is our policy to remind everyone that it is your responsibility to comply with Health and Safety, Data Protection and any other legal and/or professional guidelines there may be.

I hope the study goes well.

Best wishes
Rachel Prinn
On behalf of Virginia Pensabene CHAIR, EPS FREC

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Rachel Prinn, Research Ethics Administrator, The Secretariat, University of Leeds, LS2 9NL,
r.prinn@leeds.ac.uk
Please note my current working days are Tuesday, Wednesday, Thursday am.
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Appendix C: Water Dweller Website

As part of the output of my second study with canal boat dwellers, my research partner Dr Helen Underhill and I built a website for participatory mapping of water service points on the inland waterways. This resulted from a number of interlocutors expressing that they would like to hear more about how other boaters access and use water services. This platform was created to facilitate such knowledge sharing. We would like to continue to develop this project and share it more widely.

The website can be found here – https://waterdweller.com/