



Water conflicts: Exploring how stakeholder behaviours influence conflict (de-)escalation in practice

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ABSTRACT

Social mobilisation to demand access to safe drinking water has led to increased water justice in many places across the world in recent years. Often, the impetus for change has relied on disempowered citizens taking action. In this study, we explored the experiences of residents ($n = 22$) in Aviemore (Scotland) who have been challenging the safety of their drinking water for over a decade. We also interviewed water company employees and drinking water regulator employees ($n = 7$) who were involved in the subsequent water quality investigations. Here we frame the events in Aviemore as a 'water conflict', which clarifies that movements for water justice involve multiple stakeholders all with capacity to act. We examined the relationship between behaviours adopted by different stakeholder groups and their consequences for conflict intensity (escalation/de-escalation). Using the Thomas-Kilmann conflict instrument to assign conflict behaviours to stakeholder actions, we found, as in other social movements for water justice, the progression and escalation of this conflict was mainly driven by the citizens taking some form of action. Furthermore, prolonged passive behaviours led to conflict escalation and conflict avoidance can lead to de-escalation, but not reconciliation. Here, we offer a new approach for evaluating water conflicts by assessing the relationship between stakeholder behaviours and conflict intensity. Using this approach, we propose that case-specific insights may be identified to support the prevention of, and intervention in, real-time conflict scenarios, as well as untangling the deeper structural and relational issues contributing to repeated conflict escalation to achieve constructive change.

1. Introduction

Access to safe drinking water is regarded as a universal human right (UN, 2010) and is integral to the UN Sustainable Development Goal (SDG) target 6.1 (UN, 2015). Where this has not been achieved, citizens have mobilised and fought for water justice (Sultana and Loftus, 2020). Widely reported examples include the case in Flint, Michigan (USA) where a change in water source led the water supply to become more corrosive on aging water pipes, exposing thousands of people to high levels of lead and Legionnaires' disease (Pauli, 2019; Clark, 2020). In another example in North Dakota (USA), thousands of people set up camp at Standing Rock in 2016 to demonstrate their resistance to a planned oil pipeline, which risked contaminating the water supply to indigenous lands (Gilio-Whitaker, 2019). In Kerala (India), villagers felt compelled to begin sit-ins and hunger strikes in the early 2000s to protest the deteriorating access and quality of their groundwater, which they believed was a result of The Coca Cola Company severely depleting water reserves and disposing of sludge from their manufacturing plant

(Ciafone, 2012). In Cornwall (UK), in 1988, a water company failed to disclose a contamination incident when a delivery driver unintentionally deposited aluminium sulphate (a chemical used in water treatment) directly into the water supply (Owen et al., 2002).

In these examples the so-called 'fights' for water justice are not merely 'disputes', which are described by Hodgson et al. (2018) as manifestations of deeper problems relating to power, politics, values and beliefs. In these examples, activists reacted to racially aggravated disregard of the right to safe water (Clark, 2020), government-mediated dispossession (Swyngedouw, 2005) and organisational deception with fatal repercussions (Morris, 2012). Drawing on theory from Peace and Conflict Studies, we agree that conflicts do not arise from specific issues themselves, nor are they isolated, but rather that they emerge from wider societal structures, events and behaviours (Lederach, 2003; Fink, 1968). Thus, these 'fights' are not merely manifestations, but are wholly constitutive of the problems of power, politics, values, and beliefs (Hodgson et al., 2018). We therefore argue that the above examples of water injustice are conflicts in and of themselves.

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Concepts and components from across the ‘conflict’ literature have been adopted for defining conflict in this paper. Like Fink (1968) and Dahrendorf (1958), we adopt a broad definition and consider that conflict may entail struggle, tension, disagreement, competition, opposition, violence and antagonism. In terms of interactions and consequences emerging from the perpetration of water injustice, we propose that conflict involves: resistance by both sides (Sambanis, 2004), complexity (Young et al., 2010), severe social, economic [and health] consequences for those affected (Gates et al., 2012), mutually incompatible values (Mack and Snyder, 1957) and the assertion of one parties’ interests at the expense of another (Redpath et al., 2013). These interaction and consequences highlight that conflicts are social by nature (Thomas, 1992; Cusack et al., 2021): conflicts are not isolated events, but manifest between two or more people or social groups (Redpath et al., 2013) within a social context. The behaviours adopted by these people and groups are thought to be important to the emergence of a conflict, and understanding what behaviours are adopted in any given context can help to manage a conflict (Schneider, 2002).

The Thomas-Kilmann conflict handling instrument posits that in a conflict scenario, people will respond either assertively, or co-operatively and along these axes, will exhibit one of five behaviours (Thomas and Kilmann, 1976) (Table 1). This instrument is widely used to understand how stakeholder behaviours can change in response to their experiences (Trippe and Baumel, 2015; Dominguez et al., 2016) and other stakeholders’ actions (Cusack et al., 2021; Madden and McQuinn, 2014), which can lead to phases of conflict characterised by more antagonistic behaviours and other phases which are more co-operative.

Conflicts can last for long periods of time and can change and develop in response to social, regulatory, political and economic events (Cusack et al., 2021; Madden and McQuinn, 2014; Baynham-Herd et al., 2018). Research into how these factors shape conflict dynamics has previously explored trade-offs, costs, impacts, and the temporal dynamics of conflicts (Redpath et al., 2013) and attempted to measure consensus between stakeholders in conflict with one another (Vaske, 2018). A conflict intensity curve, first proposed by Lund (1996) for application to armed conflicts, can likewise support greater understanding of conflict progression by explicating the trajectory of the conflict. The conflict curve can then be segmented to define stages or ‘levels’ of intensity. Cusack et al. (2021) adopted and adapted this concept specifically for conservation conflicts, characterising six levels of intensity (Table 2). It is important to note that although this conflict intensity curve could imply that de-escalation of a conflict could lead to the end of a conflict, others consider that conflict is normal in social relationships (Lederach, 2003) and that de-escalations are temporary, as Cusack et al. (2021) found in their case studies, and that further waves of escalation can be expected (Lederach, 2003). To our knowledge this approach has not yet been applied to water conflicts, but the intensity

Table 1

Descriptions for each of the conflict resolution strategies from the Thomas-Kilmann conflict handling instrument (Thomas and Kilmann, 1976).

Behaviour	Axis	Behaviour Description
Accommodate	Co-operative	<i>Behaviour is unassertive and co-operative; when the stakeholder attempts to satisfy the concerns of other stakeholders</i>
Avoid	<i>Unassertive/ Unco-operative</i>	<i>Actor does not acknowledge the conflict; an unassertive and uncooperative approach</i>
Collaborate	<i>Assertive and Co-operative</i>	<i>Actors attempt to satisfy the concerns of all stakeholders; an assertive and cooperative approach</i>
Compete	<i>Assertive</i>	<i>Actor pursues their desired outcome and defend their position; an assertive and uncooperative approach</i>
Compromise	<i>Assertive and co-operative</i>	<i>Actor attempts to find a mutually acceptable resolution to the conflict; an intermediary position between assertive and co-operative</i>

Table 2

Description of conflict intensity levels adapted from those proposed by Cusack et al. (2021).

Conflict Intensity Level	Action	Description
0	Coexistence or collaboration	<i>Interests of all groups do not compete, but work alongside each other</i>
1	Latent disagreement	<i>Underlying conflict is not apparent or visible between the stakeholders</i>
2	Expressed disagreement	<i>Conflict is evident in the interactions among and between stakeholders, but no actions taken to influence interests</i>
3	Unilateral action	<i>Single stakeholder group undertakes one or more action to defend their interests</i>
4	Multilateral action	<i>More than one stakeholder group undertakes action to influence other stakeholders and defend their interests</i>
5	Violence	<i>Extreme actions undertaken to defend interests which result in physical harm or death</i>

levels are theoretically applicable to the events reported in the water (in) justice literature described previously.

Pertinent to the intensity of conflicts and behaviours adopted for different conflict strategies, is the type of conflict that arises. Homer-Dixon (1991) posits there are three types of conflicts in response to environmental change (e.g. relating to water resources in this paper). Of particular relevance here is group-identity conflict. This is apparent in the conservation conflicts discussed by Cusack et al. (2021), as well as in the cases of water injustice described earlier. In group-identity conflicts, different groups faced with a change can adopt hostile behaviours, galvanising their own identity, while denigrating others (Homer-Dixon, 1991). In these circumstances, behaviours may be influenced by non-rational factors, such as feelings and emotions, which can then be institutionalised through group narratives (Sehring and Wolf, 2023). This can have a powerful impact on water diplomacy and conflict outcomes (Mamasani et al., 2024) and thus warrants further research.

In this study, we explore an ongoing conflict over water safety in Aviemore, a small rural town in Scotland, UK. We were interested in how this conflict began, why it escalated and how future water conflicts could be prevented, reconciled or transformed. To explore this, we aimed to (i) identify the drivers of the conflict, (ii) examine conflict behaviours adopted by stakeholders involved in the conflict and (iii) determine whether there was a relationship between conflict behaviour and conflict intensity. Through this paper we offer a new approach to evaluating conflict, which may support better understanding of how water conflicts can be prevented in future.

2. Methodology

2.1. Background to the case study

In Scotland, the responsibility for supplying drinking water lies with a publicly owned water company, whilst the role of the drinking water regulator is to ensure that drinking water is safe to drink. Approximately 97 % of households in Scotland are connected to a mains water supply, which for 99.9 % of the time is compliant with water quality regulations (DWQR, 2023). The Water Industry is supported and underpinned by a strong agenda from the Scottish Government, which aspires for Scotland to become a “Hydro Nation” and maximise the value of Scotland’s water resources (Greig and Rathjen, 2021). Despite this ambition, safe drinking water is not universally accessible in Scotland and there is no common understanding of what safe drinking water actually means (Anderson et al., 2024). This has led to pockets of citizen activism across the country against perceived water injustices (Dunn, 2018; Merritt, 2017).

The case study discussed focusses on an incident in Aviemore, a town

in the Scottish Highlands and here has been informed by a review of 32 documents (see [Supplementary material 1](#)). This case study has also been described by [Anderson et al. \(2024\)](#). In 2012, the water supply to Aviemore was changed from Loch Einich, a surface water loch in the Cairngorm mountains, to a groundwater source. Importantly, a new water treatment works (WTW) was also opened at the same time. Within weeks of the new water supply being introduced, the water company, drinking water regulator, and the local authority were receiving a high number of complaints about the taste and smell of the new water, skin irritation, and that kettles were ‘popping’ when the water was boiled. The water company investigated and concluded that the water being supplied to households complied with all the drinking water regulations. The water company held several public meetings, which attracted some local media interest. After three months, the regulator declared an ‘incident’ and carried out an audit of the WTW and water quality data. The regulator concluded that initially the chlorine dosing had been excessive, which may have sensitised members of the public to the change. However, the high chlorine levels had since been rectified and they could find no reason for taste and odour complaints, nor for the concerns over popping kettles and skin irritation. At this time a campaign group was established within the community.

The water company subsequently announced that they would change the disinfectant from chlorine to chloramine, which involves a lower dose of chlorine, to resolve outstanding taste and odour complaints. However, the community in Aviemore were concerned about this change, and following support from a high-profile environmental activist (Erin Brokovich), there was substantial media interest with members of the community featuring in news reports on national radio and television, and in a documentary film.

In 2017, despite resistance from the community, the water company proceeded with their plans to change the disinfection process. Shortly after this, a review was undertaken by the National Health Service (NHS) to investigate whether there was a link between the change in water quality and the reports of skin irritation. Six weeks later, the NHS announced that the water was safe and was not causing harm.

The community presented a petition to the Scottish Parliament, which asked the petitions committee to review the role of the drinking water regulator and to consider independently reviewing the safety of chloramine as a drinking water disinfectant. The water company and regulator were both called to give evidence; however, although there is no formal record of subsequent events in the conflict, there have been ongoing debates and complaints on social media.

Two main stakeholder groups (‘Water Professionals’ and ‘Residents’ of the community) were involved in this conflict, though these are not homogeneous groups. The Water Professional stakeholder group includes water company employees and drinking water regulator employees. Whilst the water company played an active role in the conflict, the drinking water regulator (as an organisation) had a much more muted role. Employees of the regulator undertook two investigations, in 2012 and 2016, which involved visiting water treatment works, but did not involve direct consumer engagement.

2.2. Positionality

We have adopted an interpretivist research paradigm, with the understanding that the participants involved in this research construct meaning from the social context of their lives and experiences ([Neuman, 2014](#)). We contend that the Residents and Water Professionals interpret their position, power, and righteousness in this conflict based on their social interactions and their perceived reality is created and reproduced through these interactions ([Blaikie and Priest, 2017](#)). The interpretivist paradigm enables us to interpret both groups as experiencing and enacting their own realities ([Blaikie and Priest, 2017](#)) irrespective of their, or our, disciplinary affiliation. Between 2012 and 2019, the lead author (HA) worked for the water company involved in this case study and analysed many of the samples first-hand. HA was intrigued by the

gulf in understanding and the mutual exasperation between the Residents and the Water Professionals. In recognition of her insider-outsider status ([Corbin Dwyer and Buckle, 2009](#); [Kerstetter, 2012](#)) as a former employee, the interpretivist paradigm also supports us in avoiding the assertion that either stakeholder is morally or intellectually ‘right’.

2.3. Approach

This study is part of a larger study, which aimed to understand different views of drinking water safety and to identify factors that influence these understandings ([Anderson et al., 2024](#)). This paper builds on these findings by specifically exploring how division and conflict have emerged from the different understandings of safety and to examine opportunities for integration and reconciliation. Data collected for this study included posts on Twitter (now referred to as X) relating to the water conflict, formal documents (including newspaper articles) and semi-structured interviews with people with direct experience of the conflict. Ethical approval was obtained from the University of Stirling’s General University Ethics Panel (Reference numbers: 271 and 2009).

2.3.1. Twitter posts and formal documents (Stage 1)

In the first stage of this research, we collected Twitter data and formal documents (including reports, meeting minutes and news articles) to form a complete narrative of the conflict. This data was obtained by searching for keywords in Twitter’s advanced search function, based on the lead author’s prior knowledge of the conflict and included: ‘Aviemore’, ‘water’, ‘Strathspey’, ‘Badenoch’ and ‘cattle’ (relating to reports that cattle would not drink the water, which was the source of much of the media attention, but these stories were not returned using the other search terms). Additional data were sourced by searching Google with the same search terms and all relevant articles were downloaded, while further documents were shared by participants in subsequent conversations about the research. As Twitter data has a reputation for fostering inflammatory dialogue ([Rasmussen et al., 2022](#)), it was important when designing the research that narratives from both stakeholder groups would be obtained and therefore, the analysis of formal documents provided some assurance that the narrative analysis would not be unduly biased towards one group. While in this case Twitter data did represent both stakeholder groups and initial caution about sensational posts were largely unfounded, both the timing of this conflict (beginning in 2012) when social mobilisation via social media was just starting to emerge ([Amor et al., 2013](#)), and the aging demographic of the case study area ([NPPP, 2022](#)), may have mitigated some of the risk that the dataset might have represented a more extreme perspective among Residents. Future research using social media data should account for this risk.

The Twitter data and documents were analysed using dialogical narrative analysis, which seeks to account for the context of the storytelling ([Parcell and Baker, 2018](#)), in Nvivo (v12). Each Twitter post and document was deductively coded ([Blaikie and Priest, 2017](#)) using an adapted list of questions posed as crucial for interpreting a narrative ([Frank, 2015](#)) (see [supplementary material 2](#)). These questions helped to explore how the stories within each of the posts and documents were told and what it was about the social context of the telling of them that influenced individuals’ positions within the conflict. The individual stories were then brought together into story typologies, which described the overarching narratives being told across the sources (See [supplementary Material 3](#)). Narrative analysis has previously been used in the study of a conservation conflict ([Hodgson et al., 2022](#)) where researchers were interested in the stories stakeholders told to justify their actions and to understand patterns within different stakeholder groups. Similarly, here, we were interested in understanding the stories that were being told, how these sustained engagement in the conflict and therefore the ongoing adoption of conflict behaviours. In recent studies involving larger scale, geopolitical, water conflicts (e.g., Jordan-Syria conflict over the Yarmouk River ([Hussein, 2017](#)) and the

Ganges–Brahmaputra–Meghna conflict (Brethaut, 2022)), discourse was the object of study, rather than narratives. Depending on the scale and circumstances of the conflict, future studies investigating conflict dynamics may consider narratives or discourse.

The Twitter data and documents were subsequently analysed using thematic analysis, which is described below. This pluralistic approach (analysing the same data set with different methods) is widely used to produce a richer understanding of the data for interpretation (Zelčane and Pipere, 2023). We adopted this approach as the data performed different functions depending on the method used.

2.3.2. Semi-structured interviews (Stage 2)

In the second stage of this research, we conducted semi-structured interviews with individuals with direct knowledge of the water conflict. The selection of key stakeholders for inclusion in Stage 2 was informed by the documents from Stage 1. These stakeholders included the water company and the drinking water regulator, a National Park Consultant and Residents. Purposive sampling was used in the first instance for all participants. Water Professionals and the National Park Consultant were recruited by directly contacting the individuals named in the formal documents from Stage 1 and further Water Professionals recruited using the snowball sampling technique (Bryman, 2016) to reach others with relevant experience. Residents were recruited by contacting all the community councils in the Aviemore water supply zone and asking them to nominate individuals to participate. The individuals who consented were then asked to propose further individuals, again using the snowball approach.

The semi-structured interviews were conducted online and face-to-face (depending upon interviewee preference and geographic location) between June and August 2021. An interview guide was developed using the story typologies generated from Stage 1. The interview questions were designed to respond to these and explore the overarching narratives. As the interviews were semi-structured, not every participant was asked every question from the interview guide.

The entirety of the interview transcripts, Twitter data, and formal documents were then analysed using thematic analysis (as described by Terry et al., 2017). Analysis began with a formal familiarisation phase by reading each transcript or source and writing a reflective memo. A series of twenty key events were identified in this conflict. Only those events which were recorded in the formal documents analysed in this research or were verifiable across multiple participants in the semi-structured interviews were included. These events were then assigned a conflict intensity level as described by Cusack et al. (2021) (Table 2, see supplementary material 4 for assignment justification). The data were then coded deductively for different conflict handling behaviours, in Nvivo using the Thomas-Kilmann MODE instrument (Thomas and Kilmann, 1976) (Table 1).

In line with our interpretivist research paradigm (Section 2.2 Positionality), we embrace the subjectivity of all research participants, including ourselves as researchers. In line with Braun and Clarke (2021), we do not believe that it is possible to discover a single truth, or reality through qualitative analysis. In thematic analysis, theoretical saturation is often cited as the point at which no new information is found from the data and is used to justify sample size and the end of data analysis (Braun and Clarke, 2019). However, as it is the (in our view) subjective researcher who analyses the data, the point at which saturation is achieved is also subjective. Rather, we have provided detailed information on how the data has been queried, the range of story typologies identified (Stage 1) and coding justification (Stage 2) in Supplementary Material 2, 3 and 4, respectively.

The quotes included in the results are assigned the label 'Resident' followed by a number, or Water Professional. As there were fewer water professionals, they were not assigned a number as it increases the risk that they would be identifiable across multiple quotes.

3. Results

The data collected for Stage 1 of the research consisted of 117 Tweets and 32 formal documents (see supplementary material 1 for list of documents). For Stage 2, interviews were conducted with 30 individuals who included Residents ($n = 22$), Water Company Employees ($n = 4$), Drinking Water Regulator Employees ($n = 3$) and a National Park Consultant ($n = 1$). The water company and regulator employees largely held the same views and will henceforth be described as the Water Professional stakeholder. The Residents and National Park Consultant held similar views on this specific issue and will be described as the Resident stakeholder group.

3.1. Conflicting narratives

Fifteen story typologies were defined following the narrative analysis of the Twitter data and formal documents. These typologies were amalgamated into themes, and those taken forward for discussion here are those which are clearly conflicting (Fig. 1). The 'narrative' was largely expressed by the Resident stakeholder group, while the 'counter-narrative' tended to be expressed by the Water Professionals. The conflict narratives are summarised as (1) harm, (2) chemical, (3) sensory preference and (4) regulation. These narratives emerged and were prominent at different times in the conflict, which is described in the subsequent sections. The adoption of different narratives throughout the events sustained and further entrenched feelings of discontent and maintained engagement in the conflict.

These narratives, originally identified from the analysis of Twitter posts and formal documents, were all evident in the interviews. Furthermore, there was intra-group consistency with regards to the narrative positions held by each of the stakeholders across all data sources. However, the interviews revealed some nuance with weaker alignment with narrative positions for some individual stakeholders. For example, some Residents acknowledged the importance of using some chemicals in water treatment, but none of the Residents interviewed adopted the Counter Narrative position (Chemical); similarly, one Water Professional believed that Residents truly experienced the water as unpleasant, but did not adopt that position themselves (Sensory Preference).

3.1.1. Harm

The conflicting harm narratives between the stakeholder groups highlighted highly emotive and polarised opinions. This narrative emerged early in the conflict, but was increasingly evident after the change in disinfectant and when a review was held into the impact of this change. The Residents used their experience of health conditions, especially skin complaints to evidence their belief that the water was harmful:

"I had noticed that a lot of patients who had long standing eczemas and psoriasis were getting flare ups of their condition and other patients who had not previously had skin problems were experiencing issues with mild eczema." (Resident #14)

The Water Professionals, on the other hand, were confident that the water was not causing harm. They were involved in arranging a review by the consultant in public health medicine at NHS Highland (the regional health authority). NHS Highland later concluded that there was no link between the alleged increase in skin complaints and the new water source:

"NHS Highland [regional health authority] did a very thorough investigation looking at particularly with skin irritation...They concluded that there were no issues." (Water Professional).

Another Water Professional drew on their professional expertise and were confident that the water was not causing harm:

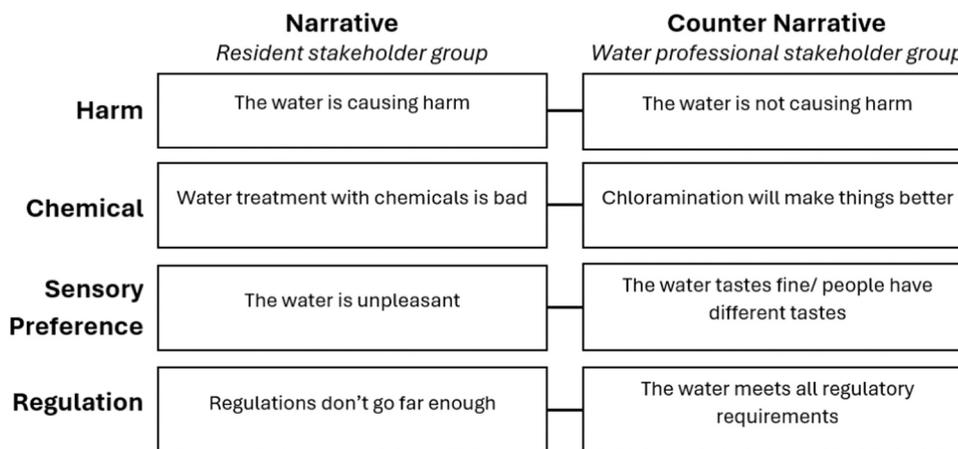


Fig. 1. Conflicting narratives identified in Twitter posts and formal documents. The narratives were expressed by the Resident stakeholder group and the counter narratives by the Water Professional stakeholder group.

“I still remember one poor lad whose parents brought him along to one of the sessions covered head to toe in eczema and really going on about this is due to the hardness in the water, the change in the hardness in the water. This is where my scientific head comes in to say there’s no link at all, especially at these very low levels in terms of hardness and eczema.” (Water Professional)

However, when the change in disinfection process was announced, Residents were notified that extra care would have to be taken when using the water for dialysis, for babies and for fish tanks. Although the information shared with Residents seems to have been based on scientific evidence, with little explanation as to why, the Residents were left to reach their own conclusions, i.e., if the water was not safe for vulnerable people, then it must be harmful:

“And also kidney patients were not allowed to [drink the water], fish tanks... children under 2 or 3 years of age...If it’s so healthy, then why can I not give it to my child?” (Resident #7)

Some of the Water Professionals expressed concern at over-complicating matters for Residents. However, by not explaining the ‘science’ to the Residents, Residents inferred meaning from the lack of explanation, and became suspicious:

“They’re telling us it’s safe, but how do we know it’s safe?” (Resident #8)

3.1.2. Chemicals

A common perception among Residents was that the water company was adding too many chemicals during the drinking water treatment process of the new water source. This narrative was primarily identified in all data sources in relation to, or after, the proposed change in disinfection process where there was concern about ammonia being added:

“It automatically makes you think about cleaning products.” (Resident #8).

There was confusion as to why the groundwater source, which was of supposedly excellent quality would need more treatment than the previous source:

“Our water is not from a mountain loch, but from a hole in the ground, dark, in many ways secure, quite frankly, but needing a lot more chemicals than needed for the mountain loch.” (Resident #3)

However, an employee of the regulator explained that the previously used Loch Einich source was failing to meet the required standards and would likely have needed further treatment if its use continued. Therefore, the stakeholders in this case had different perceptions of the

quality of the original water source, which subsequently influenced the Residents’ suspicions that the chemicals were unnecessary and that the chemicals were causing harm:

“People were having all sorts of health issues...It was the chemicals, it may not have been the water, but it was the chemicals.” (Resident #3)

Nevertheless, there was a general acceptance among the Residents that some chemicals were necessary.

“I know that they have to put some chemicals in, but to me, they’ve overdone the amount of chemicals and the number of chemicals.” (Resident #11)

In this case, the Residents wanted the concentration of chemicals to be as low as possible, which is entirely consistent with the objective of water treatment from the perspective of Water Professionals:

“Chemicals in there are actually as low as we possibly can...” (Water Professional)

There was recognition from this Water Professional that there appeared to be a gap in understanding between the two stakeholder groups:

“We basically then had two hours of absolute grilling from the local community...why were we using all these dangerous chemicals? And that’s about the awareness of water quality.” (Water Professional)

Another Water Professional seemed to sympathise with the concerns of the community when they acknowledged that ‘we’ are all paranoid about chemicals:

“I think ultimately it goes back to the paranoia we all have about the chemical stories.” (Water Professional)

This participant went on to suggest that this conflict might be prevented or de-escalated with better communication.

3.1.3. Sensory preference

Another point of contention between the stakeholder groups was the sensory preference of the drinking water. This was the first narrative to arise in the conflict and was also the most pervasive across all data sources and consistent across all interviewees. Most Residents interviewed were dissatisfied with the taste and smell of the water and many insisted that animals wouldn’t drink it:

“The taste, the smell...It was revolting.” (Resident #12)

“It was well known that the animals in the area stopped drinking the water.” (Resident #23)

The Water Professionals countered this narrative by either arguing that different people have different tastes or claiming that the water tasted fine.

“We do recognise that a small number of customers have found the chlorine levels – necessary to ensure the water safe – not to their taste.” (Spokesperson from STV News Article [National Scottish television channel], 2016)

“I also went around various service reservoirs at various points in the system, tasting the water to see if I could taste anything unusual or unpleasant. I couldn’t, it was just normal water.” (Water Professional)

Therefore, the Residents were raising concerns about the taste of the water and Water Professionals were tasting the water and deeming it to be acceptable, which highlights the challenge of subjective sensorial water quality parameters:

“It seemed to be, you could talk to 10 different people and get 10 different opinions.” (Resident #2)

There was recognition that if there was an objective test for taste and odour, the concerns might be taken more seriously:

“If the water tastes and smells disgusting, isn’t there something objective we could do to just to explain that?” (Resident #5)

Whilst others felt the problem was self-evident:

“They should send somebody down, or a couple of people down to sniff it when the water comes out the tap and it should be self-evident that there is a problem. It’s not rocket science.” (Resident #4)

This suggests that Residents thought Water Professionals put too much reliance on the formal testing procedures. However, one Water Professional particularly acknowledged the importance of people’s experiences of the water:

“I went out to see them and said I’m struggling to understand what the issue is, but we’ve got the chemical analysis tools, but they’re limited, so I’m not sure that it’s a PCV [prescribed concentration or value (maximum safe limit)] issue, but I do know that it’s a taste and odour issue. I’m trying to understand what it is in order that we can then do other testing... You’ve got to accept what people are saying.” (Water Professional)

However, several Water Professionals emphasised that taste was not necessarily an indicator of safety, which is the priority for them.

“So, taste in itself is not a measure of safety, nor is appearance...people would not know that water contained a totally unacceptable level of trihalomethanes because it probably tastes alright, but it does influence their perception of how safe it is.” (Water Professional)

There was also a recognition that regardless of the technical compliance, the Water Professionals had changed its priorities over the decade-long period of the conflict, prioritising customer enjoyment more:

“We would now, I think, be more aware and concerned...but then the concern was more: is it safe to drink?... We now consider anytime we change anything, any water supply, we consider not just what the chemistry looks like, but also what will feel different to the consumers of that water.” (Water Professional)

This suggests that although this has been a conflicting narrative during this case in Aviemore, this would not necessarily happen again in future.

3.1.4. Regulation

The regulation narrative emerged later in the conflict after the Water professionals justified the continued supply of the water because it complied with the regulations. Regulatory compliance is a priority for the Water Professionals as they have a statutory duty to ensure that

water supplied is not harmful to health:

“Safe water is in essence [water which] meets the standards.” (Water Professional)

Again, there seems to be a gulf in understanding between the stakeholder groups, which has led to suspicion by Residents:

“I think that the regulations have been manipulated...They can baffle you with the rhetoric and scientific [sic] and the regulator or whoever can come along and they can...manipulate the facts.” (Resident #8)

Other Residents believed that the regulations were not sufficient, for example:

“It only complies with the regulations that are imposed on it, it doesn’t comply with [other disinfection by-products]. They’re not monitored, and they’re not regulated.” (Resident #10)

Employees of the Regulator explained that even if the regulations don’t stipulate specific contaminants, anything with potential to cause harm should be monitored and regulatory compliance reflects that:

“[The water company] has got a responsibility to risk assess for that [other contaminants of concern] and measure that as well. Anything that can cause harm basically. Ideally it should be measured.” (Water Professional)

As an example, the Water Professionals explained that ‘unregulated’ disinfection by-products from chloramination had been monitored to ensure they were not present in sufficient quantities to cause concern:

“We told [the water company] they had to do that monitoring...you should be monitoring for a bigger range of disinfection by-products...just because it’s not listed in the regulations, it doesn’t mean it doesn’t have to be monitored. It does get monitored.” (Water Professional)

Although the monitoring revealed that there were no concerns, there was hesitancy to share that information with Residents, despite the concern over disinfection by-products being key in the petition presented to parliament:

“We wanted to get a broad sweep of disinfection by-products of chloramination because they’re not as well known...we didn’t proactively communicate it and we probably wouldn’t. I think the benefit of communicating that work would probably be outweighed by the disbenefit of stirring up things again.” (Water Professional)

Therefore, the conflicting narrative held by the stakeholders (that regulations don’t go far enough, and that regulatory compliance means the water is safe) is based on very different information and knowledge. If the Residents were aware that parameters not included in the regulations were being monitored, this might support conflict resolution.

3.1.5. Intragroup conflict

Although we have interpreted two sides in this conflict, the people within each stakeholder group are not homogenous. There was substantial disagreement between actors within stakeholder groups. For example, a drinking water regulator employee expressed disagreement with how the water company had approached the problem and described them as “painfully keen”, implying that they did not agree with how conciliatory the water company had been. Another Water Professional was very sympathetic to the views and experiences of the Residents and believed that there was a problem, but not one that was showing up in the scientific data. In the Resident stakeholder group there were pre-existing disagreements, but broadly those who agreed that there was a problem with the water seemed to feel it was best to work together to achieve the common goal of improving their water supply.

3.2. Characterisation of the conflict and its progression

A conflict intensity curve (Fig. 2) was constructed using the intensity characterisation proposed by Cusack et al. (2021) (Table 2). This approach was expanded by overlaying the conflict behaviours adopted by the stakeholders to determine whether there is any relationship between conflict behaviours and escalation/ de-escalation. Over the course of a decade, this conflict had a somewhat gradual escalation through to Level 4 (Multilateral action) in 2017 but has now started to de-escalate to Level 2 (Expressed disagreement).

3.2.1. Early conflict (Level 0 – Level 2)

Initially there was a lot of co-operative behaviour from all stakeholders (Fig. 2). Residents adopted a collaborative approach, while Water Professionals adopted an accommodating approach:

“I then contacted [the water company] and asked for them to check my water out and basically a nice gentleman came round...” (Resident-#22)

“We made the commitment, if they thought they had a problem with the water supply we would come and investigate it.” (Water Professional).

However, as the conflict remained unresolved and escalated to Level 3 (Unilateral action), the dominant behaviours also changed.

3.2.2. Mid conflict (Level 3–4)

Residents began to adopt a ‘competing’ strategy, which is assertive and less co-operative than their initially preferred ‘collaborative’ strategy’ (Thomas and Kilmann, 1976):

“It was an absolute disgrace how they handled the meeting; and just after that meeting, we formed the Spey Water Group, of course that was the last thing they expected and of course we kind of got black-billed for doing it.” (Resident #12).

Meanwhile, the Water Professionals transitioned from a more passive ‘accommodating’ approach to a more active ‘collaborative’ approach and demonstrated ‘compromising’ behaviour when they proposed changing the disinfection process from chlorination to chloramination:

“Since the new supply was put in [we] have received feedback that some people have taste and smell issues...because of the feedback [we] have looked at further improvements, one of which was a proposal of chloraminated water supply.” (Water Professional, quoted from Aviemore and Vicinity Community Council meeting minutes, 16th June 2016).

However, this did not achieve resolution, nor de-escalation, and Residents were largely found to have been either opposed to, or unaware of the proposed change, as interpreted from the formal documents and interview transcripts. Initially, Residents referred back to a ‘collaborative’ approach, before reverting to a ‘competitive’ approach as they engaged with local and national media to raise awareness of their plight. The change proposed by the Water Professionals was subsequently implemented despite a lack of acceptance by the Residents, which we have characterised as both exhibiting a compromising and competing strategy:

“[Water company] is to press ahead next week with chloramination plans of the local drinking water despite concerns that adding another chemical – ammonia – could aggravate existing health issues.” (Strathspey & Badenoch Herald [local newspaper], 30th March 2017)

This was identified as both ‘compromising’ and ‘competing’ as the change was made in attempt to resolve the complaints; however, the change was made despite knowing that it was not preferred by the Residents.

The change to chloramination from chlorination preceded the escalation of the conflict to Level 4 (multilateral action), when an NHS review into the health complaints of the Residents was announced. Initially, this triggered a collaborative strategy by all stakeholders,

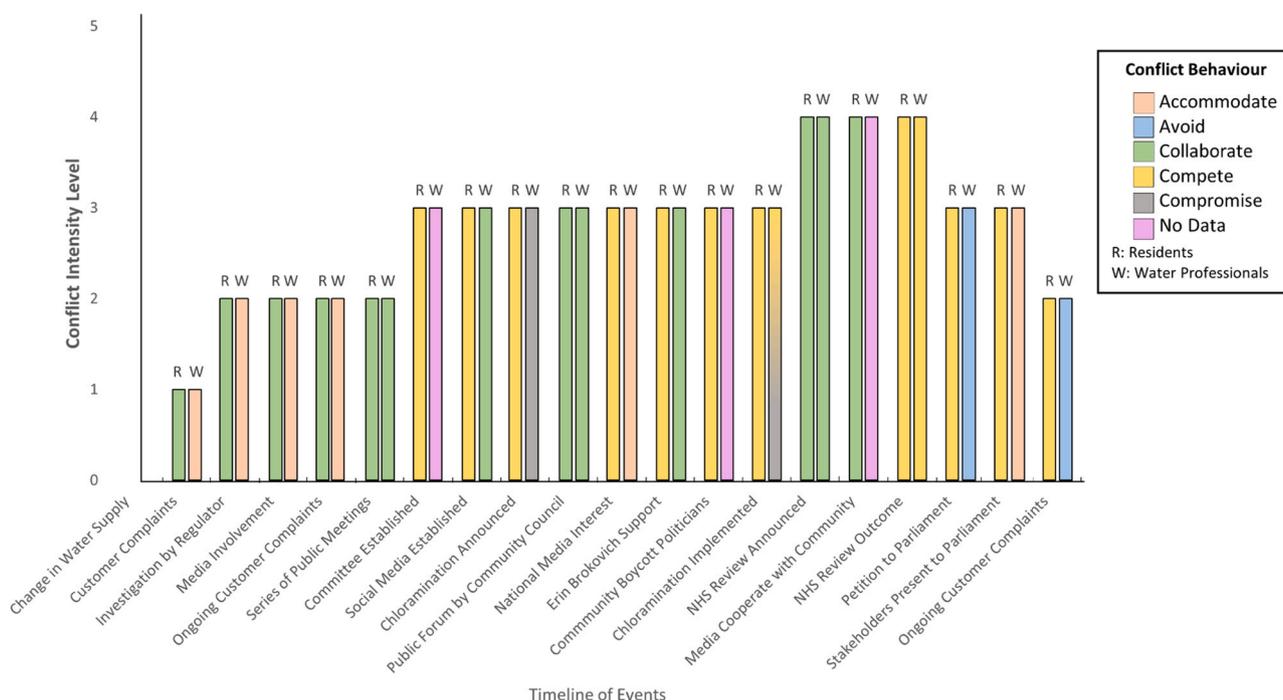


Fig. 2. Conflict intensity curve showing escalation of conflict through events (x-axis) using conflict intensity levels from Cusack et al. (2021) (y-axis). (The conflict intensity levels are as follows: Level 1 - Latent disagreement, Level 2 - Expressed disagreement, Level 3 - Unilateral action, Level 4 - Multilateral action, Level 5 - Violence). The conflict behaviours adopted by each stakeholder, based on the Thomas-Kilmann conflict MODE instrument are colour coded by strategy and shown in separate bars for each of the stakeholders. The bar on left hand side of each event represents Residents (R) and bar on right hand side of each event represents Water Professionals (W) (See supplementary material 4 for examples of the coded strategy by event) Where no data was available, it is still represented in a bar as in each of these cases lack of data does not suggest a change in the conflict level.

perhaps because each stakeholder viewed this as an opportunity to prove their position. Residents continued their campaigning activities and the local media attempted to gather evidence to present to the NHS review, whilst the Water Professionals worked together to assess the health impact of the water. This culminated in both stakeholders adopting a competing strategy as they defended their position considering the outcome of the review, which concluded there was no health impact from the water. The Residents argued that the review methodology was not appropriate:

“Their way of doing this was to see whether our referral rates to dermatology departments in [the nearest big hospital] were higher than other practices and they decided that no they weren’t any higher...the reasoning from our point of view was that we do most of our dermatology work in house and there was no reason to further refer on these patients.” (Resident #14)

Whilst the Water Professionals felt vindicated:

“There was no evidence for any increased level of eczema in the area and it was actually lower now than before the supply changed over.” (Water Professional)

3.2.3. Late conflict (Ongoing (Level 3 to Level 2))

Subsequently, the Water Professionals adopted an ‘avoidance’ strategy, where they stepped back and did not engage further, despite a petition being lodged at the Scottish Parliament. They adopted an accommodating strategy when they consented to appear before the Environment, Climate Change and Land Reform Committee, before adopting an ‘avoidance’ strategy again by no longer directly engaging with the residents, and now believe that the conflict is effectively over:

“I don’t think we’ve had complaints for a while.” (Water Professional)

The Residents continue to adopt a ‘competing’ strategy despite the de-escalation of the conflict and continue to express their disagreement (Level 2):

“It’s not over because it’s still going on, but they think it’s over.” (Resident- #23).

4. Discussion

4.1. Water justice through a conflict lens

Here, we have framed the struggle for water justice in Aviemore as a conflict because it has involved resistance by both stakeholders, involved complexity, led to social, economic and health consequences and involved the advancement of one parties’ interests at the expense of another (Sambanis, 2004; Young et al., 2010; Gates et al., 2012; Redpath et al., 2013). We propose that other cases of water injustice might benefit from a conflict framing, including the examples highlighted earlier (Clark, 2020; Pauli, 2019; Ciafone, 2012; Gilio-Whitaker, 2019; Owen et al., 2002). The literature on water justice often implies that the citizens are disempowered (Carrera and Key, 2021); however, it is these same citizens who have protested and campaigned to demand justice. Framing these struggles for justice as ‘conflicts’ makes explicit that injustice is something that is perpetrated, not only experienced. Furthermore, it compels those involved in the perpetration of injustice, as well as the citizens, to seek resolution.

We used a novel approach for understanding conflict and identifying opportunities for intervention and reconciliation. Using the Thomas and Kilmann (1976) conflict behaviours allowed us to standardise our interpretation of actions taken by the different stakeholders and compare these actions between the stakeholder groups. Our application of the conflict intensity curve (developed in Cusack et al., 2021) enabled us to evaluate the severity and impact of conflict across its trajectory. By superimposing the conflict behaviours for each stakeholder onto the

conflict intensity curve, we have been able to gain an insight into where conflict intervention might be more successful and when it should be avoided.

Our study is a response to calls for developing research that promotes workable solutions and is based on understanding the social interactions underlying conflict (Cusack et al., 2021; Baynham-Herd et al., 2018). The application of this approach to additional conflicts may provide greater insight into whether the relationship between stakeholder behaviour can predict intensity and duration of conflict. This may be more challenging for more complex conflicts involving more than two stakeholder groups, which was not analysed here, but we believe that this knowledge could support decision makers in live conflict situations.

4.2. Power asymmetries and the emergence of conflict

Power asymmetries are apparent across each of the conflict narratives identified as drivers of this conflict. In Aviemore, there was an implicit assertion of power by the Water Professionals to decide, control, allocate and manage the water, which often disregarded the views and experiences of the Residents. The power structures underlying the decisions over changing the water source, which water to use, whether it caused harm, whether it was enjoyable and what regulations supported these decisions, revealed the prevailing power and social relations, which was also apparent in the conflict behaviours adopted by the stakeholders. The Residents persisted in trying to pursue a solution to their problem, predominantly adopting assertive behaviours to resist their experience of injustice. The Water Professionals exhibited non-assertive behaviours, but did not pursue a solution to the Residents’ problems, but rather relied on their implicit power to reassure the Residents that there was no need for a solution. This highlights that existing power asymmetries were utilised and further entrenched. Making unilateral decisions over water in this way, intentionally or not, neglects the principle that in addition to being about “quantity, quality, availability or access...[the human right to water is] fundamentally about the right to participate in water governance and power structures that influence those rights” (Sultana, 2020, p11). This has led the Residents to lose trust in the Water Professionals, as they felt they were excluded from participating. Although the underlying power structures supported the perpetuation of this exclusion and the disempowerment of the Residents, the Residents challenged the Water Professionals albeit with limited success in reaching a resolution and de-escalating the conflict. Whilst the power asymmetries continue to be enacted and reinforced, particularly through the Water Professionals ongoing ‘avoidance’ strategy, trust cannot be restored, and a resolution seems unlikely.

Implicitly underlying this power asymmetry between stakeholders are the different worldviews, knowledge and societal roles of the Water Professionals, compared to the Residents. These have been identified by other researchers who found that different ontological framings, knowledge prioritisation (technical) and assuming the position of the expert, can have a powerful effect on responses to and the progression of conflict (Gomis and Mejía-Salamanca, 2024; Jafari et al., 2024; Roth et al., 2021). We similarly found that the stakeholders’ epistemologies, tensions between different forms of knowledge (technical versus experiential) and a shift in the role of the ‘expert’ were pertinent to the development of stakeholder relationships and the conflict itself in this case study. We have discussed this in more depth in a previous publication (Anderson et al., 2024).

4.3. Insights for conflict intervention and recommendations

The conflict behaviours theorised by Thomas and Kilmann (1976) imply an orientation towards conflict resolution. Intuitively the behaviours which are co-operative (Table 1) are more likely to support resolution, whereas those which are non-co-operative do not. However, these alone are not sufficient for understanding where intervention

might be best implemented or avoided. Therefore, we propose three points for consideration when planning conflict intervention and have offered corresponding recommendations in Table 3.

4.3.1. Early intervention may be important to prevent conflict progression

In the early days of the conflict, the Resident stakeholder group consistently exhibited collaborative behaviours as they sought a resolution. However, as the conflict progressed with no sign of resolution, group identities began to be established between the stakeholder groups, exacerbating inter-group conflict (Tajfel and Turner, 2004) (escalating to Level 3). The group began to organise and assign roles, a stage of social movement described by Viikè (2021) as ‘bureaucratisation’. This process subsequently led to feelings of animosity and distrust between the two groups. Thus, we propose early conflict intervention before

Table 3
Recommendations for conflict prevention, intervention and reconciliation.

Insights	Recommendations
<i>Early intervention may be important to prevent conflict progression</i>	<p>Acknowledge different perspectives Acknowledging the different priorities and values of the stakeholders, through the implementation of more tailored engagement with individuals, having an openness to collaborate on a solution and better opportunities for participation of all stakeholders may realign understandings of justice.</p> <p><i>Example from our case study</i> Had stakeholders understood that other stakeholders had different priorities, this conflict may not have escalated. For example, Water Professionals were most concerned with the scientific water quality data and considered that more important than sensorial quality of the water. Residents were more concerned with the sensorial qualities of the water and did not value the water quality data as it contradicted their experiences. If these different priorities were recognised early on in the conflict and interventions developed collaboratively, this might have prevented the conflict progressing.</p>
<i>Conflict behaviour may affect the success of mediation</i>	<p>Identify and communicate common objectives to set and manage expectations It is important that all stakeholders are aware of what the objectives of different conflict interventions are. This could be facilitated by having an impartial intervener, or mediator.</p> <p><i>Example from our case study</i> By collaborating on the interventions to resolve the conflict and making the objectives (e.g. of public meetings) and expectations clear, time and animosity might have been saved when the Residents and Water Professionals were working at cross-purposes. Although NHS Highland could have acted as an impartial intervener, they were considered by many Residents to be biased.</p>
<i>Conflict avoidance is not conducive to reconciliation</i>	<p>Identify conflict drivers Understanding the drivers of the conflict might present opportunities for intervention and resolution.</p> <p>Be mindful of conflict duration The likelihood of reconciliation becomes more remote the longer the conflict continues, as stakeholders are prone to withdrawal and/or fatigue.</p> <p><i>Example from our case study</i> Better recognition of what was driving the discontentment for Residents (i.e., chloramination), would have highlighted where greater care and collaboration could have been invested to avoid escalation. The duration of this conflict has led to many of the Residents disengaging despite still feeling they have experienced an injustice.</p>

these group identities have been established.

4.3.2. Conflict behaviour may affect the success of mediation

In our case study, we found that although there was no formal mediation, after a prolonged period (which Regan and Stam (2002) argue is most likely to be constructive), NHS Highland had the potential to take on the role of *de facto* mediator. The adoption of collaborative behaviours by both the Residents and the Water Professionals at this stage, suggest that both stakeholders were willing to seek resolution. Rather than an open collaboration between all stakeholder groups, collaborations were limited to being between either the Residents and NHS Highland, or between the Water Professionals and NHS Highland. This was a missed opportunity to foster greater inter-group collaboration, and we propose that it may be the conflict behaviour exhibited by the stakeholders that influences the success of mediation (resolution), rather than the act of mediation itself.

4.3.3. Conflict avoidance is not conducive to reconciliation

In the latter stages of the conflict, the Water Professionals exhibited an avoidance conflict behaviour, which emerged following the outcome of the NHS Highland review. Although the conflict de-escalated, there was no reconciliation. In this case there is a risk that the conflict will enter cyclical periods of latency followed by re-escalation (Crowley et al., 2017; Cusack et al., 2021). Therefore, de-escalation does not equate to reconciliation and for genuine conflict resolution, ‘avoiding behaviour’ risks prolonging the conflict. We propose that avoidance has undermined any short-term opportunities to reconcile as there have been no avenues left for that to be achieved.

4.4. Transformation: moving beyond recurring conflict events

This paper has explored a live and dynamic conflict, and our recommendations proposed in Table 3 ultimately aim to facilitate conflict prevention, intervention and reconciliation. Reconciliation may describe the development of, or restoration of good relations (Alderdice, 2015), which implies the transition out of a conflict and into a future where relationships between conflicting parties are improved. For practitioners working in real-time conflict scenarios, it is this outcome that we hope the recommendations will support.

However, as we intimated earlier, conflict does not occur in isolation and the apparently pressing issue (e.g. in this case, a change in water source/treatment) is seldom the real root of the conflict (Fink, 1968; Lederach, 2003). A transformation perspective on conflicts, as articulated by Lederach (2003) views not only the discrete “episodes” in a conflict, as we have explored in-depth through our conflict analysis, but also the broader context of the conflict, which includes the history of interactions and short-term solutions, as well as interrogating the deeper issues, including the structural relationships underlying the conflict. He posits that conflicts do not end, but repeatedly re-emerge in a spring-like manner. Ultimately, conflict transformation goes beyond resolution and seeks constructive change through this process (Reimer and Schmitz, 2021).

Whilst the aim of this study was to understand how this specific conflict in Aviemore (Scotland) began, why it escalated and how future water conflicts could be prevented or reconciled, it is important to recognise that conflict is normal in social relationships and can present an opportunity to move towards a constructive change (Lederach, 2003; Jafari et al., 2024). Drawing on Lederach’s (2003) conflict transformation model, it is crucial to untangle the context and issues underlying a conflict. In our case study, we have discussed in-depth the impact of behaviours on conflict progression during and between conflict “episodes” (illustrated in Fig. 2). With respect to the deeper issues underlying the conflict, we have identified power asymmetries between stakeholders as being pertinent to the period of latency stakeholders currently find themselves in and their vulnerability to further waves of conflict. We hope that as well as supporting practitioners dealing with

conflicts in real-time, our recommendations might begin to address the longer-term relational patterns apparent in this conflict, and while it might not be possible to bring the conflict to an end, to support progress towards change, and conflict transformation.

5. Conclusion

In this paper, we examined a water conflict in Scotland with the aim of understanding why it happened, how it might have been avoided and ultimately to work towards more just water futures. By framing cases of water injustice as conflicts, as we have done here, we have demonstrated that it is possible to deconstruct events that unfold during a water conflict and examine the impact of each stakeholder group on conflict progression.

We have developed a novel approach to conflict analysis, drawing on theoretical concepts from conflict studies, and use the events in Scotland to illustrate that conflict behaviours are pertinent to the progression, escalation and de-escalation of a conflict. Whilst we have offered several recommendations from the application of this approach to the case study, this was a small-scale, sub-national conflict with only two stakeholder groups. Future studies using this approach for larger-scale conflicts should take care to fully capture the different stakeholders whose behaviours and actions may affect the conflict and to reflect on how different perspectives might best be understood.

We propose that this approach to conflict analysis offers a means of identifying case-specific insights for understanding when conflict may be prevented and opportunities for intervention in real-time conflict scenarios. Further than this, by understanding the behaviours of stakeholders during a conflict and how these are linked to shifts in the intensity, it may help to navigate the relationships between stakeholders to untangle deeper structural and relational issues. By understanding these deeper issues, solutions and interventions may be developed to move stakeholders beyond cyclical episodes of conflict escalation. We believe that water justice is a requisite for people to enjoy their right to safe water and that conflict analysis, particularly that which recognises conflict as a means to achieve constructive change, may help to overcome impediments to justice.

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Author Contributions

The authors confirm contribution to the paper as follows: study conception and design: HA, HP, RQ; data collection: HA; analysis and interpretation of results: HA, HP, RQ; draft manuscript preparation: HA. All authors reviewed the results and approved the final version of the manuscript.

CRedit authorship contribution statement

Price Heather: Writing – review & editing, Validation, Supervision, Funding acquisition, Formal analysis. **Anderson Heather:** Writing – review & editing, Writing – original draft, Visualization, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Quilliam Richard:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Heather K Anderson reports a relationship with Scottish Water that

includes: employment. The relationship declared here is that the corresponding author Heather K Anderson was formerly employed by Scottish Water, one of the organisations involved in the case study. This is declared in the methods section, along with steps taken to mitigate any impact of relationship. This relationship was also declared to all research participants. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.envsci.2025.104096.

Data availability

We do not have permission to share the entirety of the interview transcripts. However, the supplementary material contains excerpts of the interview transcripts to evidence analytical decision making.

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